UC-NRLF
B 3 314 718

LIBRARY
UNIVERSITY OF CALIFORNIA
DAVIS

Digitized by the Internet Archive
in 2007 with funding from
Microsoft Corporation

http://www.archive.org/details/manualconcholo17tryorich

SECOND SERIES: PULMONATA.

MANUAL

OF

CONCHOLOGY

STRUCTURAL AND SYSTEMATIC.

WITH ILLUSTRATIONS OF THE SPECIES.

FOUNDED BY

GEORGE W. TRYON, JR.

CONTINUED BY

HENRY A. PILSBRY, Sc. D.,

SPECIAL CURATOR OF THE DEPARTMENT OF MOLLUSCA, ACADEMY OF
NATURAL SCIENCES OF PHILADELPHIA.

VOL. XVII.

AFRICAN ACHATINIDÆ.

PHILADELPHIA:
Published by the Conchological Department,
ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA.
1904–1905.

LIBRARY
UNIVERSITY OF CALIFORNIA

PREFACE.

In discussing the African ACHATINIDÆ the Author enters an unfamiliar field. The great Powers of Europe, England, Germany and France have made a large part of African soil their own; and the molluscan spoils gained by soldier, explorer and missionary have been made known to science by English, French and German conchologists. Many of the more recently described species have been collected but once, and are to be found in a single museum. Under these circumstances it will be understood that in the treatment of species the views of such masters of the science as Eduard von Martens, Edgar A. Smith, J. R. Bourguignat, Arthur Morelet and others have been adopted, and their works freely quoted. In larger matters of classification the author has felt upon more familiar ground, and several reforms, notably the dismemberment of the genus *Achatina*, are submitted for the consideration of malacologists. The attention of those obtaining African material is earnestly directed to the fact that only two or three genera of African *Achatinidæ* are adequately known anatomically, and almost nothing is known of some of the commonest West and South African genera.

H. A. P.

CONTENTS.

PAGE

Family ACHATINIDÆ........................... vii
  Anatomy of Achatininæ........................viii-xv
  Key to genera of Achatininæ.................... xv
  Subfamily Stenogyrinæ......................... xvi
  Key to genera of Stenogyrinæ.................. xviii

Descriptions of Genera and Species.

Genus ACHATINA Lamarck.............................. 1
  Subgenus *Leptocala* Ancey......................... 72
Genus COCHLITOMA Fér., Pilsbry..................... 76
Genus ARCHACHATINA Albers, Pils.................... 104
Genus COLUMNA Perry.................................. 120
Genus CALLISTOPLEPA Ancey.......................... 125
Genus HOMORUS Albers................................. 130
  Subgenus *Subulona* Martens........................ 138
Genus CERAS Dupuis et Putzeys...................... 155
Genus PSEUDOGLESSULA Boettger...................... 156
Genus CHILONOPSIS F. de Waldheim................... 171
Genus BOCAGEIA Girard................................ 216
  Subgenus *Petriola* Dall............................ 216
Genus CLAVATOR Martens.............................. 192
Genus RIEBECKIA Martens............................. 204
Genus RUMINA Risso................................... 211

APPENDIX 216
  Genus LIMICOLARIA................................... 216

Index to genera and subgenera....................... 219
Reference to plates.................................. 221
Dates of issue of the parts of vol. xvii.......... 232

[illegible] 137

MANUAL OF CONCHOLOGY.

Genus ACHATINA Lamarck, 1799.

Achatina Lam., Prodrome d'une nouvelle classification des Coquilles, in Mémoires de la Société d' Histoire Naturelle de Paris, an VII (1799), p. 75 (type and sole species *Bulla achatina* L.); Syst. An. s. Vert., p. 90, same type.

Ampulla Bolten (in part), Mus. Boltenianum, edit. I, p. 110 (1792); edit. II, p. 78 (1819).

Chersina [Humphrey], in part, Museum Calonnianum, p. 62 (1797). Contains *Bulla virginea* L. and *Bulla achatina* L.

Achatium Link (in part), Beschreib. Rostock Sammlung, p. 137 (May 17, 1807).

Achatinus Montfort, Conch. Syst., ii, p. 418-420.

Cochlitoma Fér. (in part), Tableau Systématique, p. 48.

Archachatina Albers (in part), Die Hel., 1850, p. 189.

Oncaea Gistel, Handbuch der Naturgeschichte aller drei Reiche, 1850, p. 550 (substitute for Achatina).

Parachatina Bourguignat, Moll. de l'Afr. Equat., p. 73, 1889.—*Serpæa* Bgt., t. c., pp. 74, 85.—*Pintoa* Bgt., t. c., p. 80.

Urceus Klein, Jousseaume, Bull. Soc. Zool. France, ix, 1884, p. 171 = *Achatina* Lam.

Shell ovate or oblong with conic spire and small apex, two or three earliest whorls smooth, forming a trochiform nucleus, obtuse at the apex. Aperture ovate, the outer lip unexpanded; columella concave or straight, truncate as though cut off below.

Soft anatomy (see Introduction to this volume). Reproduction oviparous, the eggs small, oval and pale yellow, numerous.

Type, *Achatina achatina* (L.).

Distribution: Tropical Africa. *Achatina* extends northward to about 7° above the equator in East Africa (Gallaland), and a degree or two higher in the west (Sierra Leone). Southward, the genus is roughly limited by the Tropic of Capricorn, but in the east a few species descend to the latitude of Delagoa Bay, or about 25 S. Lat. South of the Tropic, most Achatinoid species now known belong to the genera *Cochlitoma* and *Metachatina*.

The EGGS of *A. panthera* are small and numerous. One individual deposited its eggs while in my possession. I counted 196. They were oval, yellow, with a thin calcareous shell; length 6 mm. (*Gibbons,* J. of Conch., ii, 143). In *A. fulminatrix* von Martens found dull pale-yellow eggs measuring 6 x 5 mm. The size of the egg-capsule seems to vary much less than that of the adult, judging from the data at hand, the length of the egg being from a tenth to a thirtieth that of the adult shell.

The EPIPHRAGM of *Achatina* (pl. 42, fig. 8, *A. panthera mossambica,* after Brancsik) has been described and figured by Crosse (1881, *A. panthera,* Nossi-Be), Brancsik (1893, *A. mossambica*) and Smith (1899, *A. immaculata*). It is pure white and porcellanous, lusterless outside, but within covered with a glossy film which has a pearly luster. In the narrow upper portion there is a slit outside and a raised ridge within, which "looks exactly as if a knife had been thrust through from the outside so as to force the substance out into a ridge," which may be either slightly slit along the summit, or imperforate. It is about as thick as the epiphragm of *Helix pomatia,* and is notched below to fit the contour of the aperture. (See *Crosse,* J. de C., 1881, p. 197, pl. 8, f. 2; *Brancsik,* Jahresh. Trenc. Com., 1893, pl. 10, f. 2; *Smith,* P. Mal. Soc., iii, 309).

Achatina is a less evolved group than *Burtoa, Metachatina, Cochlitoma, Archachatina,* or *Pseudachatina.* The first two have been further modified in the structure of the columella, while the last four have attained a higher type of reproduction and have made more progress in sculpture-evolution, shown by the advance of adult sculpture upon the nepionic whorls.

Parasites: Professor O. F. Cook has described a wingless fly, *Wandolleckia achatinæ*, which he found running about on *Achatina variegata* in the deep forests of Liberia (Science, N. S., vi, 1897, p. 886). Stuhlmann has observed green mites upon several East African species, but they have not been studied.

The species of *Achatina* "appear to grade one into the other, and the more examples we have, the greater the trouble becomes. The genus is spread over the greater part of Central and West Africa, as far north as Senegambia, and each district seems to produce its special race, a modification of some neighboring form, so that the separation of species becomes more and more difficult through the discovery of intermediate links from every fresh locality" (E. A. Smith, P. Z. S., 1899, p. 579).

Nomenclature.

Of the names proposed to include species of this genus, *Ampulla* of Bolten has precedence, or would have if that catalogue were an acceptable source of nomenclature. It contained *A. achatina* Gm., Conch. Cab., ix, pl. 118, f. 1012-13; *A. purpura* Bolt., *op. cit.,* f. 1017-18; *A. kambeul* Bolt., *op. cit.,* f. 1024-25; *A. zebra* Bolt., C. Cab., f. 1014; *A. priamus* Bolt. = *Halia,* and several synonymous names. Lamarck's elimination of the Achatinas from this group renders further consideration of it unnecessary in this connection. In my opinion, neither the *Museum Boltenianum* nor the *Museum Calonnianum* are to be regarded as scientific literature, any more than dealer's catalogues at the present day. The two works mentioned stand or fall together; both are very rare, the *Museum Boltenianum* being apparently the scarcer of the two.

Achatium of Link was proposed in an excessively rare work, of which almost the whole edition is known to have been destroyed by fire. Up to this time the single species *Bulla achatina* L. had been referred to *Achatina* Lam. Now

Link explicitly places *Achatina* Lam. in the synonymy of his group, and the first species of his list is *A. achatina;* there seems, therefore, to be no escape from the conclusion that *Achatium* is an absolute synonym of *Achatina.* The following species are included:

A. elegans Link (= A. achatina L., young).
A. zebra Link (= A. zebra Brug.).
A. virginicum Link (= Liguus virgineus L.).
A. fasciatum Link (= Liguus fasciatus L.).
A. perversum Link (= Amphidromus perversus L.).

The generic name *Achatinus* first occurs on p. 418 of Montfort's work, under a figure evidently drawn from *A. panthera.* On the next page the type is stated to be *A. zebra;* and on p. 420 Montfort writes: "C'est à de Lamarck que l'on doit l'etablissement du genre agathine." Since *Achatinus* has page-priority for *A. panthera,* and is admitted to be identical with Lamarck's genus, I consider it a synonym, and not available for the South African group herein eliminated from *Achatina.* Pfeiffer has considered *Achatinus* to pertain to the typical section of *Achatina.*

Cochlitoma Férussac comprised species of *Atopocochlis, Perideris, Corona, Liguus,* and *Achatinæ* of the *A. achatina, zebra* and *bicarinata* groups. No type for *Cochlitoma* has been selected, so far as I can learn. It has been considered a synonym of *Achatina* by all recent authors. After the elimination of species belonging to the genera mentioned above, there remains one which I propose to select as type of *Cochlitoma.*

Oncaea of Gistel was proposed as a substitute for the name *Achatina,* with the remark, "Der Farbename *Achatina* musste geändert werden." It becomes, therefore, an absolute synonym of *Achatina. Oncaea* contained the following species: *O. perdix, O. purpurea, O. virginea* [= *Liguus*], *O. crenata, O. marginata, O. pallida* [= *Cochlicopa?*]. Of these, *O. crenata* and *marginata* are new species, not identifiable from the descriptions.

Archachatina Albers was proposed for the typical group of *Achatina,* with a list of species comprising forms of the

A. achatina, A. purpurea and *A. zebra* groups. I propose to restrict the name to species of the *bicarinata* type, that being the first species of Albers' list.

Bourguignat, in 1889, made an ineffective attempt to dismember *Achatina*. He defined the following groups:

1. *Tripachatina* for *A. vignoniana* Morel. This group is a synonym or section of *Limicolaria*. See vol. xvi, p. 254, no. 10.

2. *Parachatina* for *A. thomsoni* Sm., *dohrniana* Pfr. and *welwitschi* Morel., species characterized by the want of columellar truncation, which is replaced by a tuberculiform eminence. These species belong, by their apical characters, to *Achatina s. str.* The columellar structure varies widely and is of only minor systematic value. In many species of diverse groups of *Achatina* the amount of columellar truncation is reduced by the tapering of the lower end of the columella. A similar process has resulted in the condition reached by *Burtoa*.

3. *Serpœa* for small globose species with the shell thin and transparent. *A. hortensiæ* Mor., *dammarensis* Pfr., *knori* Jonas, *varicosa* Pfr. (the young only), *obesa* Pfr., *pintoi* Bgt. This list includes species of several of the most diverse groups of *Achatina*.

4. *Achatina* including all the other large species of West, South and East Africa. A heterogeneous group.

4*a*. *Pintoa* for slender, elongate species, such as *A. pfeifferi* Dkr.

WEST AFRICAN SPECIES.

The West African Achatinæ are usually more richly colored than the East African, and they are more diversified in form, size and coloration. No species are yet known to be common to the West and the Lake region or east coast.

LITERATURE OF WEST AFRICAN SPECIES. The larger Achatinæ of the coastal region from Sierra Leone to Gabun were among the first known, and were figured and described in the works of Seba, Linnæus, Chemnitz, and other early authors. Many of them are beautifully illustrated in Reeve's Conchologia Iconica, and have been well described by Pfeiffer in the Monographia Heliceorum. Adolf d'Ailly, in his Contributions a la connaissance des Mollusques terrestres et d'eau douce de Kaméroun, in Bihang till K. Svenska Vetenskaps-Akad. Handlingar, xxii, Afd. iv, no. 2 (1896), has treated the *Achatinidæ* occurring in Kamerun with the ability of a master. Further southward, our knowledge of the species of the Portuguese territory, Angola, etc., is very largely due to the work of Arthur Morelet, in the Voyage du Dr. Friederich Welwitsch dans les Royaumes d'Angola et de Benguella, Mollusques terrestres et fluviatiles (1868). The species of the vast Congo basin are still known by only a few descriptions by Dupuis and Putzeys in the publications of the Royal Malacological Society of Belgium.

Key to West African Achatinæ.

I. Shell small (alt. less than 50 mm.), thin, ovate, the diam. more than half the length. Whorls 6 to 6½.
  - *a.* Greenish-buff or greenish-brown with dark streaks; spire short.
    - *b.* 45 x 24, apert. 26 mm.; Damaraland. *dammarensis,* no. 17.
    - *bb.* 32 x 19 mm.; Angola. *hortensiæ,* no. 18.
  - *aa.* Pale fulvous with zebra stripes, whorls 6, 18 x 12 mm. *mollicella,* no. 27.
  - *aaa.* Broad chestnut stripes confluent at base, broken or reduced on the spire; suture with brown margin; 33 x 17 mm. *sylvatica,* no. 26.

II. Shell rather small, length 35 to 65 mm., *narrow,* the diam. of shell and length of aperture much less than half the length of the shell; usually streaked or striped; whorls 7½ to 9. Species no. 21 to 25.

III. Shell ovate or oblong, the diam. half the length or a little less; shell of moderate or large size.
  - *a.* Shell granulate or spirally striate throughout; spire long; aperture and columella pale.
    - *b.* Thick; finely plicatulate and densely granulate throughout; 108-140 x 49-67, apert. 57-75 mm. *balteata,* no. 29.

bb. Rather solid or thin, wrinkled and very densely and finely striate spirally; green or brown, with or without broad, indistinctly defined streaks; 110-130 mm. long. *rugosa,* no. 28.

bbb. Thin; evenly granulate throughout; fulvous with wide obscure streaks; 128 x 56, apert. 72 mm. *iostoma,* no. 30.

bbbb. Rather solid, finely granulose-striate; olive-yellow, bedaubed with reddish-chestnut blotches; 75 x 29, apert. 35 mm. *allisa,* no. 32.

aa. Shell smooth or nearly so below the middle of the last whorl.

b. Shell whitish under a yellow cuticle, with bent or zigzag flames or stripes, rarely plain.

c. Columella and parietal wall rose-red.

d. Very large, 170 x 95 mm., with zigzag flames. *achàtina,* no. 1.

dd. Plain olive-yellow; 96-120 mm. *monochromatica,* no. 1*a*.

ddd. With indistinct fulvous streaks or nearly plain; 95 x 53 mm. or smaller. *oblitterata,* no. 5.

cc. Columella and parietal wall white or bluish.

d. With bold, broad, black-brown zigzag stripes.

e. 148 x 65, apert. 69 mm. *buchneri,* no. 2.

ee. 93 x 50, apert. 47 mm. *weynsii.* no. 3.

eee. Length 80, apert. 38 mm. *tincta,* no. 4.

dd. Shell rather thin, with numerous rather narrow stripes.

e. Fulvous, with close, narrow-waved stripes; 87 x 28 mm. *perfecta,* no. 8.

1e. Irregular streaks and flames of buff, chestnut and fulvous; obsoletely granulose at sutures, 78 x 38, apert. 42 mm.
inæqualis, no. 31.

2e. Corneous-buff, with rather wide stripes, 68 x 39 mm. Ovampoland.
schinziana, no. 9.

3e. Pale straw with longit. zebra stripes; 63 x 31 mm. Old Calabar. *studleyi,* no. 6.

4e. Brownish-white, lightning-striped with red-brown; 58 x 28, apert. 30 mm. Benguela.
semisculpta, no. 7.

bb. Shell white under a thin yellow cuticle, not noticeably darker basally; spire long; last whorl smooth except near suture; apert. hardly half the length; columella sinuous, narrowly truncate; 70 x 34, apert. 34.5 mm.
occidentalis, no. 19.

bbb. Shell brown or blackish-brown, often darker basally, usually with some darker longitudinal streaks but not zigzag striped.

c. Solid and heavy, very dark, columella narrowly truncate, tapering 100-125 mm. long.
dohrniana, no. 12; *bandeirana,* no. 13.

2c. Thick, ponderous, flattened at sutures, livid-whitish under a thin, tawny cuticle, 142 x 65 mm. *monetaria,* no. 14.

3c. Moderately solid, rufous-brown with darker streaks.

d. 126 x 61 mm. *welwitschi,* no. 11.
dd. 63 x 33 mm. *paivana,* no. 10.

4c. Shell thin, colored like the last.

d. 74 x 40 mm. *bayaona,* no. 15.
dd. 67 x 31 mm. *tavaresiana,* no. 16.

1. A. ACHATINA Linne. Pl. 31, fig. 1.

Shell very large, acutely ovate, rather thin, yellow variegated with red-brown longitudinal streaks often zigzag in places, the upper whorls roseate or whitish. Sculpture of fine, irregular foldlets along growth-lines, cut into long granules by decussating spirals; this sculpture is stronger and coarser below the suture, and becomes subobsolete below the periphery. The spire is *straightly conic,* whorls about 8½, slightly convex, the *last whorl inflated.* Aperture large, bluish-white within. Columella concave, narrow, and with the entire parietal wall of a *deep rose color.* Outer lip thin and acute. Length 170, diam. 95, length of aperture 96 mm.

West Africa: Freetown, Sierra Leone (U. S. exped.). Liberia, not rare, the largest 200 mm. long (Dohrn). Akkra, on the Gold Coast (Buchholz).

Bulla achatina L., Syst. Nat. (10), p. 728; (12), p. 1186. *Cf.* Hanley, Ipsa L. Conch., p. 210.—GMEL., Syst. Nat. (13), p. 3431.—DILLWYN, Descr. Cat., i, p. 494.—*Buccinum achatinum* MULLER, Hist. Verm., ii, p. 140.—*Bulimus achatinus* BRUG., Encycl. Méth., i, p. 358.—*Helix achatina* FÉR., Hist., pl. 131, f. 1-3; 131 A, f. 1-3; 131 B.—*Achatina variegata* LAMARCK, Syst. An. s. Vert., p. 91 (1801).—ROISSY, in Buffon, Hist. Nat. gen. et partic. des Mollusques, v, p. 354 (1805).—REEVE, Conch. Icon., v, pl. 1, f. 3, pl. 5, f. 3*b*.—DESH. in Fér. Hist., p. 155.—PFR., Monogr., ii, p. 249; iii, 482; iv, 600; vi, 211; Conchyl. Cab., p. 290.—PHILIPPI, Abbild., iii, p. 31, pl. 2, f. 4 (young shell).—STEARNS, Proc. U. S. Nat. Mus., xvi, 1893, p. 327, no. 47.—DOHRN, Jahrb. d. D. Malak. Ges., v, 1878, p. 155.—VON MART., Monatsber. K. P. Akad. Wissensch., 1876, p. 257.—*Achatina perdix* LAM., An. s. Vert., vi, p. 127 (1819).—*Achatina zebra* BLAINV., Malacology, p. 456, pl. 40, f. 1.—*Achatium elegans* LINK, Beschreib. Rostock Samml., p. 137 (1807), based upon Chemnitz, Conch. Cab., ix, pl. 118, f. 1012, 1013.—*Ampulla achatina, bombarda, flammea* and *lacteae* BOLTEN, Mus. Boltenianum, p. 110.—*Chersina tigrina africana* HUMPHREY, Mus. Calonnianum, p. 63.

The largest species and type of the genus *Achatina.* The narrow columella and smallness of the notch at its base are prominent features. The acutely conic spire, small apex and thin lip distinguish *A. achatina* from *marginata.* The young shells are often more boldly marked than the adults, on a lighter yellow ground.

The egg 25 x 17 mm. attributed to this species by von Martens (Sitzungsber. Ges. naturforsch. Freunde, 1891, p. 33) must belong to the large form of *A. marginata.* A large egg-capsule is always associated with a dome-like summit in the shell, which *A. achatina* does not have. Its egg will be found to be comparatively small, probably less than half the dimensions given above.

Mr. Ancey states that "several forms have been confounded under this name (*variegata*), which are worthy of distinction; one of them, from Assinie, always smaller in size, has been named by me *A. chaperi*" (Bull. Soc. Malac. de France, v, 1888, p. 70, footnote 4). I have been unable to find any further description of this form.

1*a*. Var. MONOCHROMATICA, n. v. Pl. 32, fig. 3.

Shell somewhat smaller, white under the smooth and glossy olive-yellow cuticle, which is uniform except for some faintly darker streaks marking growth-stages, and a faint peripheral belt. Suture distinctly margined. Aperture smaller than in *achatina,* colored the same. Length 120, diam. 65, aperture 66 mm.

West Africa: Angola (A. N. S. coll.).

A. variegata Roissy, RVE., C. Icon., v, pl. 5. f. 3*c*.—DESH., in Fér., Hist., pl. 124, f. 3, 4.

It is usually smaller than the type, Reeve's figure measuring about 96 mm. long. This shell meets the requirements of Bruguiere's *Bulimus fulvus* better than the East African forms which authors have associated with that name.

2. A. BUCHNERI Martens. Pl. 6, fig. 11, 12.

Shell subturrite oblong, obsoletely decussate; buff, painted with rather wide black-brown streaks, generally lightning-zigzag and narrow above. Whorls 7, nearly flat, the suture crenulate. Aperture about equal to half the length of the shell, the columellar margin a little arcuate, *bluish-white.* Length 148, diam. 65, aperture 69 x 35 mm. (*Mts.*).

On the river Kuilu, an affluent of the Kassai, in the Angola hinterland, about 22° e. lon.

A. buchneri v. MARTENS, Jahrb. d. Malak. Ges., 1882, p. 245; Conch. Mittheil., i, p. 138, pl. 26.

Distinguished from *A. achatina,* which it resembles in color and marking, by the want of red on the columellar margin, the more lengthened contour, slighter convexity of the whorls and smaller mouth. The suture is not accompanied by an impressed line. *A. indotata* Rve. has a broader, blunter apex, thinner shell, more convex whorls, the upper ones more strongly granulate, and the columella is more strongly curved. Description and figure from v. Martens.

3. A. WEYNSI Dautzenberg. Pl. 17, fig. 17.

Shell rather solid, elongate, ovoid. Whorls 8, the first 1½ subplanate, the following convex, separated by a more or less distinctly marginate suture; the last whorl more than two-thirds the total length. The surface is shining and appears smooth at first sight, but under a lens the early whorls are seen to be finely punctate, and the following ones very delicately shagreened. There are also, moreover, distinct descending lines on the upper part of the last whorl and over the whole of the preceding whorls. Aperture nearly half the length of the shell, the lip acute and simple. Columella nearly straight, a little twisted, obliquely truncate at the base, the margins joined by a thin callous. Color white, with very wide, zigzag, blackish-brown flammules, which ordinarily tend to predominate, so that the last whorl sometimes seems to be black with some white lightning-stripes; but they are always narrower below the suture, leaving a lighter zone along the upper part of the whorls. The cuticle is golden-yellow. The summit is purple-rose or deep violet, nearly black. Columella and interior of the aperture covered with a bluish enamel, showing the flames by transparence. Length 93, diam. 50, aperture 47 x 30 mm. (Dautz.).

Congo Free State: Upper Congo (Capt. Weyns, in Mus. l'Etat Indépendant).

Achatina weynsi DAUTZ., Ann. Soc. Roy. Malac. Belg., xxxiv, Séance du 2 Dec., 1899, p. 27 (1900).

Remarkable for its beautiful coloration. It differs from *A. kraussi* by the less high last whorl, shorter, more perpendicular and less arcuate columella, non-crenulate suture, or with the crenulation extremely weak, and by the distinct and more angular flames. It is smaller than *A. tincta,* more oval, less turrited, the columella especially narrower, and the surface finely shagreened, while that of *A. tincta* is entirely smooth. *A. buchneri* Mart. also has some resemblance to *A. weynsi,* but its spire is larger, more conic, and the surface is wholly covered with fine, regular granulation, while *A. weynsi* is irregularly shagreened and more glossy. The coloration is also quite diverse. (*Dautz.*).

4. A. TINCTA Reeve. Pl. 18, figs. 21, 22, 23.

Shell oblong-ovate, rather thin; whitish, vividly colored with large longitudinal spots, covered with a yellowish cuticle. Spire a little elevated, the apex obtuse, roseate. Aperture oblong, white. Length 3.3, diam. 1.5 inch. Mus. Cuming, Stainforth. The *Achatina tincta* has a white shell covered with a yellowish epidermis, and it is singularly stained in a longitudinal direction with a deep morone [maroon] color. The stains take the form of bands in some places, but exhibit no degree of regularity (*Reeve*).

West Africa: Angola (Fr. Rois Batalha). Leopoldville Congo, numerous in clearings (E. Dupont).

Achatina tincta RVE., P. Z. S., 1842, p. 55; Conch. Syst., ii, pl. 179, f. 18; Conch. Icon., v, pl. 11, f. 29.—PFR., *Monogr.,* ii, p. 252; iii, 488; iv, 603; vi, 217; Malak. Bl., xvi, 1869, p. 253, pl. 1, f. 1-4.—DAUTZENBERG, Bull. Acad. Roy. Sci. Belg. (3 ser.), xx, p. 567 (1891).—*A. mauritiana* POT. ET MICH., Galerie des Moll. du Mus. de Douai, i, p. 129, pl. 11, f. 11, 12 (exclusive of references and locality).

Pfeiffer gives the following diagnosis of the type specimen, the figure of which is copied on pl. 17, fig. 23: Shell oblong-ovate, rather thin, smooth, white, streaked and lightning-striped with broad rufous spots, covered with a tawny cuticle. Spire oblong-conic, the apex obtuse, blushing. Whorls 7½, a little convex, the upper obsoletely granulate, last about four-ninths the length. Columella somewhat twisted, obliquely truncate. Aperture oval, milk-white inside; peristome simple. Length 80, diam. 35, aperture 38 x 21 mm.

The specimen in Brit. Mus., subsequently figured by Reeve, is larger, 116 x 50 mm., apert. 53 mm. (pl. 17, fig. 22).

The locality was unknown to Reeve, but Pfeiffer, in 1869, received a series from Angola, showing great variation in coloration, size and the subsutural margination. The most constant characters of the series are the long spire, always longer than the aperture, and the complete smoothness of the shell, which barely shows traces of a fine granulation on the upper whorls under a strong lens, while the last whorl can hardly be said to be "obsoletely substriate." Besides the typical form with black-brown flames and bluish columella, there is a form with pale-colored flames, or almost uniform brown-yellow, the columella and parietal callous beautiful rose-red. Shell thicker and heavier throughout. This form Pfeiffer considered to belong to *A. tincta* as a variety; but it has been separated by Dautzenberg under the name *A. oblitterata.*

5. A. OBLITTERATA Dautzenberg. Pl. 18, fig. 20; pl. 19, figs. 24, 25.

Shell imperforate, ovate-oblong, glossy, rather solid, the spire conoid, turrite, apex a little obtuse. Whorls 8, quite convex, rather regularly obliquely plicate with growth-striæ, the suture obsoletely marginate with an impressed line. Last whorl a little shorter than the spire. Aperture ovate, the margins joined by an adnate callous. Columella nearly straight, twisted, narrowly truncate, the lip simple. Color whitish, indistinctly flamed with fulvous streaks, under a buff cuticle. Aperture bluish-white within the throat, the columella and parietal callous vivid rose. Length 95, diam. 53, aperture 45 x 30 mm. (*Dautz.*).

West Africa: Leopoldville, in clearings in the forest (E. Dupont).

Achatina oblitterata DAUTZ., Bulletins de l'Académie Royale des Sciences, des lettres et des Beaux-arts de Belgique (3), xx, no. 12, p. 567, pl. 1, f. 1 (1891).—*A. tincta* var., PFR., Malak. Bl., xvi, 1869, p. 256, pl. 2, f. 1-4.

This shell belongs to the same group as *A. tincta* Reeve, and is very closely related to that. The sculpture is the same; the shape is a little more swollen, less slender; but the chief difference is in the coloration. In *A. oblitterata* the longitudinal flammules are inconspicuous or disappear at the periphery of the last whorl, while in *A. tincta,* on the contrary, these flammules are very dark colored, almost black, and increase in intensity towards the base. Moreover, in *A. oblitterata* the columella and callous are of a bright rose color, while these parts are milky or bluish-white in *A. tincta.*

Pfeiffer received this form with *A. tincta* and figured specimens in 1869. He notes that it is a thicker shell than *A. tincta,* and varies from indistinctly flammulate to almost uniform brownish-yellow (pl. 19, figs. 24, 25).

6. A. STUDLEYI Melvill & Ponsonby. Pl. 40, fig. 4.

Shell ovate, rather tumid, a little attenuate towards the apex, thin. Whorls 8, the apical unicolored, simple, the rest rather swollen, the upper whorls and upper half of the lowest being minutely granular, these granules being very small and regular; below the middle the last whorl is smooth and beautifully suffused with bright chestnut-brown; the ground-color of all the whorls is pale straw, but they are ornamented with longitudinal, dark brown, zebra-like markings. The aperture is oblong, within bluish, outer lip thin. Length 63, diam. 31 mm. (*M. & P.*).

West Africa: Old Calabar (T. Studley).

Achatina studleyi M. & P., Proc. Malac. Soc. London, ii, p. 291, fig. in text (November, 1897).

"This is a most distinct and beautiful species, though in many ways similar to the Natalese *A. semigranosa* and *A. granulata* Pfr. Mr. Layard says it is common in the district whence it came, since it is sold in the markets and largely eaten by the natives."

This form seems to be very similar to *A. schinziana* Mouss., but the figure differs in showing a longer aperture and wider columella.

7. A. SEMISCULPTA Pfeiffer. Pl. 10, figs. 27, 28, 29.

Shell ovate-elongate, thin, longitudinally regularly striate. Brownish-white, painted with lightning-like reddish streaks. Spire conic, the apex rather obtuse, regularly granulose with close concentric lines. Whorls 7½, a little convex, the last about equal to the spire, decussate by distant impressed lines as far as the periphery. Columella nearly straight, abruptly truncate. Aperture oval-acute; peristome simple, unexpanded.

Length 58, diam. 28, aperture 30 x 16 mm. (*Pfr.*).

Length 55, diam. 23 mm. (*Pfr.*, type).

West Africa: Loanda (Cuming coll.); Benguela (Dr. Tams); sandy thickets of the district of Mossamédès, near Girdul, Benguela (Dr. Welwitsch).

A. semisculpta PFR., Proc. Zool. Soc. Lond., 1845, p. 74 (Oct., 1845); Conchyl. Cab., p. 331, pl. 28, f. 2, 3, and *var.*, pl. 44, f. 6; Monogr., ii, p. 255; iii, 487; iv, 603; vi, 216.—DKR., Zeitsch. f. Mal., Nov., 1845, p. 163; Index Moll. Guin. Inf., p. 7, pl. 1, f. 41, 42.—REEVE, Conch. Icon., v, pl. 11, f. 37.—MORELET, Voy. Welwitsch, p. 70.

This species, like *A. pfeifferi,* belongs to the sandy shore zone. It was described from Cuming's collection, and Reeve remarks that all of Mr. Cuming's examples "are distinguished by the same broken, interrupted style of painting." Fig. 29 is one of these specimens, after Reeve.

Pfeiffer describes a variety as larger, white, longitudinally streaked with fulvous; length 75, diam. 34 mm., from the Cuming coll.

8. A. PERFECTA Morelet. Pl. 4, fig. 26.

Shell ovate-elongate, thin, translucent, beautifully granulate, the granulation evanescent below the periphery, glossy fulvous, longitudinally painted with reddish sinuous and waved streaks. Spire long-conic, the suture impressed. Whorls 8, convex, the last a little shorter than the spire. Columella nearly straight, truncate, pale, suffused with violet above. Aperture oblong, semioval, opalescent within, the bands showing through. Peristome unexpanded, thin, brown-edged. Length 87, diam. 28 mm. (*Morel.*).

West Africa: district of Pungo-Andongo; also at Sange, on the rocky hills along the Cuango, Angola (Welwitsch).

A. perfecta MOREL., Voy. Welwitsch, p. 70, pl. 4, f. 2 (1867).—PFR., Monogr., viii, p. 276.

Remarkable for its coloration.

9. A. SCHINZIANA Mousson. Pl. 17, fig. 19.

Shell imperforate, ovate-elongate, thin, strongly striate, less so below, the striæ *conspicuously granulated* by others in a spiral direction. Corneous-buff, painted with wide stripes, sometimes lightning bent. Spire conic, regular, *the summit minute,* acute, whitish; suture indistinctly crenulate. Whorls 8, the nuclear 2 polished, the following ones acutely granulate, a little convex, the last whorl ovate, not inflated, a little longer than the spire, not ascending, nearly *smooth beneath.* Aperture subvertical (its plane 13 degrees with the axis), acutely long-oval, showing the external stripes within; peristome unexpanded, acute, the margins remote, joined by a very thin parietal callous. Columella slender, strongly twisted and produced, acuminate below, not truncate. Length 68, diam. 39 mm. (*Mouss.*).

Southwest Africa: Ondonga, Ovampo-land, in sandy country, but not without vegetation (Dr. H. Schinz). East Africa: Sodanna, in the northeast corner of German East Africa (Dr. Passarge, 1898). Rikatla, Delagoa (Junod).

A. schinziana MOUSS., Journ. de Conchyl., 1887, p. 294, pl. 12, f. 3.—v. MART., Conchol. Mittheil., iii, pp. 6, 40; Sitzungsber. Ges. nat. Freunde, 1900, 119.—GODET, in Junod, Bull. Soc. Vaudoise des Sci. nat., xxxv, 1899, p. 278.

According to Mousson this species differs from *A. fulgurata* and *A. varicosa* by the acuteness of the summit and the torsion of the columella, which terminates in a point almost without truncation. In the last character it is unlike *A. studleyi,* which otherwise seems very similar.

Prof. Godet has identified this species from Rikatla, Delagoa, collected by H.-A. Junod, and Prof. von Martens recognizes it from German East Africa. I do not know that either identification was based upon an actual comparison of specimens. If well-founded, they give the species a wide range across the continent.

Group of A. welwitschi.

Parachatina Bgt, 1889; type *A. dohrniana.*

Varying from solid to thin, usually dark brown with some darker streaks, but no zigzag or oblique markings. Aperture and columella white, or tinted blue or lilac. Distribution, Angola; one species, *A. glutinosa,* in East Africa.

10. A. PAIVANA Morelet. Pl. 2, figs. 11, 12.

Shell oblong-conic, solid, longitudinally striate and very minutely granulate, glossy rufous-brown, streaked with a darker shade. Spire elongate, the apex rather obtuse. Whorls 8, a little convex, the last subangulate, scarcely granulated, longer than the spire. Columella white, lightly arcuate, somewhat twisted, tapering-truncate. Aperture elliptic-oval, whitish inside; peristome simple, unexpanded, thin, bordered with brown. Length 68, diam. 33 mm. (*Morelet*).

West Africa: Rocky forests of Quisembo, in the district of Ambriz, Benguela (Welwitsch).

Achatina paivana MOREL., Journ. de Conchyl., 1861, p. 158.—PFR., Monogr., vi, p. 215.—*A. paivæana* MOREL., Voy. Welwitsch., Moll., p. 65, pl. 6, f. 3 (1868).

11. A. WELWITSCHI Morelet. Pl. 2, fig. 10.

Shell oblong-conic, solid, covered with a thin reddish cuticle, which is darker below; spire conic-turbinate, pale above, more or less conspicuously flamed with reddish, the apex submamillate. Whorls 8 to 9, convex, granulose-decussate, the last whorl plicatulate-striate, obsoletely decussate in places, shorter than the spire. Columella bluish-white, arcuate anteriorly, narrowly tapering-truncate. Aperture acuminate-oval, blue within, pearly; peristome unexpanded, thin, brown-bordered, the margins joined by a moderate bluish parietal callous. Length 126, diam. 61 mm.

West Africa: Humid forests of Golongo-Alto, near Sange, and district of the Duc de Braganza, Angola (Dr. Welwitsch).

Achatina welwitschi Morel., Journ. de Conch., xiv, 1866, p. 156; Voy. Welwitsch, p. 66, pl. 5, f. 2.—Pfr., Monogr., vi, p. 217.

Morelet defines two varieties: (1) with the shell thick and ponderous, 9½ whorls, and (2) shorter, more ventricose, blackish-chestnut, thin, with stronger sculpture, found at the cataracts of the Lucala river. It has a whorl less than the type form.

12. A. dohrniana Pfeiffer. Pl. 10, figs. 30, 31.

Shell ovate-conic, solid, ponderous, but little shining, piceous. Spire conic, the apex rather obtuse; suture submarginate. Whorls 8, slightly convex, the upper smooth, white, the succeeding minutely decussate-granulose, fulvous, indistinctly red-flammulate, the last whorl longer than the spire, irregularly rugulose and minutely granulose to the base, blackish-brown, marked with irregular streaks and spots of grayish-yellow. Columella lightly arcuate, narrowly truncate at the base. Aperture subvertical, acuminate-oval, blue and very glossy inside; the peristome simple, brown-margined, the margins joined by a glossy bluish callous spreading inwards. Length 125, diam. 56, length of aperture 72, width 36 mm. (*Pfr.*).

West Africa: Angola (Fr. Rois Batalha).

A. dohrniana Pfr., Malak. Bl., xvii, 1870, p. 29; Novit. Conch., iv, p. 1, pl. 109, f. 1, 2; Monogr., viii, p. 273.—*Cf.* Dohrn., Mal. Bl., xxi, 1873, p. 79; Morelet, J. de Conchyl., xxi, 1873, p. 327; xxii, 1874, p. 60.

Dohrn considered this species to be the full-grown stage of *A. bandeirana* Morel., an opinion which Morelet opposed, pointing out that while smaller, *A. bandeirana* has a half whorl more, a vertical columella, the shell has no dark markings, and the base is not granulose, as it is in *A. dohrniana*. *A. welwitschi* is much more closely allied to *dohrniana*.

13. A. BANDEIRANA Morelet. Pl. 3, figs. 20, 21.

Shell ovate, subfusiform, solid, glossy; spire subturrited, the apex rather obtuse, smooth, whitish. Whorls 8½, a little convex, the early ones very minutely granulate, pale tawny, the last two burnt-chestnut, subregularly plicatulate-striate, decussated with narrow spiral impressions; the last whorl obscurely banded, equal to the spire or a little shorter. Columella white-blue, somewhat twisted, nearly straight, tapering-truncate. Aperture acuminate-oval, blue within; peristome unexpanded, thin, brown-bordered, the margins joined by a thin, bright blue callous. Length 101, diam. 43 mm. (*Morel.*).

West Africa: Rocky heights of the Serra de Pedras de Guinga, Angola (Dr. Welwitsch). Landana, Congo (Petit); near Banza-Manteka, in a grassy plain on the caravan route from Matade to Loukoungou (E. Dupont).

A. bandeirana MOREL., J. de Conch., 1866, p. 156; Voy. Welwitsch, p. 67, pl. 6, f. 1.—DOHRN, Malak. Bl., xxi, 1873, p. 79.—PFR., Monogr., vi, p. 213.—ANCEY, J. de Conchyl., 1902, p. 279. — DAUTZENBERG, Bull de l'Acad. Sci. Roy. Belgique (3 Ser.), xx, p. 567 (1891).

This species, named for the Marquis Bandeira, has been united by Dohrn with *A. dohrniana* Pfr., a view combatted by Morelet (*Journ. de Conchyl.*, 1873, p. 327; 1874, p. 60). Dautzenberg examined specimens collected in the Congo valley by Dupont, typical in other respects, but measuring 160 x 77 mm.

14. A. MONETARIA Morelet. Pl. 5, fig. 6.

Shell ovate-acute, thick, ponderous; livid whitish, covered with a thin, tawny cuticle. Spire contabulate, mucronate, the apex acute, flesh-colored. Whorls 8, the early ones convex, most minutely granulate, the last three horizontally flattened below the sutures, then a little convex; last whorl very large, rudely and closely granose-plicate, much longer than the spire. Columella thick, white, lightly arcuate, obliquely truncate above the base of the aperture. Aperture ample, subvertical, sinuate-oval, milk-white within; peristome obtuse, unexpanded, brown-edged outside, the outer margin shortly sinuous above, joined to the other by a wide, thick, whitish parietal callous. Length 142, diam. 65 mm. (*Morel.*).

West Africa: Country of the *Selles,* in the interior of the district of Novo Redondo, Benguela (Welwitsch).

Achatina monetaria MOREL., Voy. Welwitsch, Moll., pp. 47, 63, pl. 8, f. 2 (1868).—PFR., Monogr., viii, p. 272.

Described from one shell, which had been denuded in large part of its cuticle. The latter appeared to have been fawn-colored, with some darker longitudinal lines. The shell is remarkable for the terraced or somewhat scalariform shape of the spire, which, however, may be pathologic. The lip is thick and the interior milk-white.

The natives of Benguela cut these shells into beads, which when pierced and strung are used as money; known to the Portuguese under the name *quirandas de Dongo.* They also serve the purpose of personal adornment of the fair sex. *Achatina balteata* Reeve is still more widely put to the same uses.

15. A. BAYAONA Morelet. Pl. 3, figs. 17, 18, 19.

Shell ovate, ventricose, thin, rufous or greenish-fulvous, streaked with darker, with an oily lustre. Spire submamillate with acute apex, flammulate with red. Whorls 8½, convex, granulated to the periphery of the last, which is ventricose, rugulose striated, and longer than or rarely equalling the spire. Columella straight, arcuate anteriorly, abruptly truncate at the base. Aperture elliptic-oval, pearly within, the peristome unexpanded, thin, margins joined by a superficial callous. Length 74, diam. 40 mm. (*Morel.*).

West Africa: District of the Duc de Braganza, Angola;

forests of the district of Huilla, not far from the colony of Lopollo, Benguela (Welwitsch). Malange, on the Quanza (Coanza) river (Buchner).

Achatina bayaona MOREL., Journ. de Conchyl., 1866, p. 157.—PFR., Monogr., vi, p. 214.—*A. bayoniana* MOREL., Voy. Welwitsch, p. 68, pl. 7, f. 1.—PFR., Monogr., viii, p. 274.—MARTENS, Jahrb., ix, 245.

Curious for its thin texture, brilliant gloss and ventricose shape. There is a less ventricose form with longer spire of nearly a whorl more, and much thinner yellowish-green shell. Length 62, diam. 33 mm.

16. A. TAVARESIANA Morelet. Pl. 2, figs. 13, 14.

Shell ovate-subfusiform, thin, striate, glossy, buff-green, irregularly streaked with darker. Spire long-conic, obscurely flammulate, the apex a little obtuse. Whorls 8½, granulated as far as the periphery of the last one, the latter rather ventricose, longer than the spire. Columella nearly straight, obliquely truncate, pale. Aperture oblong, oval, opalescent-bluish inside; peristome unexpanded, thin. Length 67, diam. 31 mm. (*Morel.*).

West Africa: *presidio* of Pungo-Andonga, Angola, in great numbers, in the edge of the forest.

Achatina tavaresiana MOREL., Journ. de Conchyl., 1866, p. 157; Voy. Welwitsch, p. 69, pl. 5, f. 6.—PFR., Monogr., vi, p. 214.—*cf.* SMITH, P. Z. S., 1893, p. 635.

Group of A. hortensiæ (Section *Serpæa* Bgt.).

Shell small, short, strongly inflated, quite thin. *A. hortensiæ* may be taken as the type of a small group of species, indicated by Bourguignat under the name *Serpæa.* He, however, included *Achatinæ* of very diverse structure.

17. A. DAMMARENSIS Pfeiffer. Pl. 11, figs. 32, 33.

Shell ovate, thin; pale greenish-buff, marked with dark, irregular streaks. Spire conic, the vertex minute, obtuse; suture little impressed, minutely crenulate. Whorls 6½, a little convex, the upper granulate-decussate, the penult. with oblong grains formed by more distant spiral lines; last whorl nearly three-fifths the total length, somewhat wrinkled from suture to periphery and having lightly impressed spiral lines, nearly smooth below the middle. Columella whitish, arcuate, abruptly truncate. Aperture a little oblique, acuminate-oval, pearly-whitish within; peristome thin, unexpanded, the margins not connected. Length 45, diam. 24, aperture 26 x 14 mm. (*Pfr.*).

Southwest Africa: Damaraland (Dohrn coll.); Ubeb on the Khan river (A. Schenck).

Achatina dammarensis Pfr., Malak. Bl., xvii, 1870, p. 31; Novit. Conch., iv, p. 2, pl. 109, f. 3, 4; Monogr., viii, 274.—*A. damarensis* Pfr., Martens, Sitzungsber. Ges. nat. Freunde zu Berlin, 1889, p. 162; Archiv. f. Naturg., lxiii, i, 1897, p. 40.

This species has about the shape of *A. papyracea* Pfr., but is much more nearly related to *A. bayaona* Morel. It differs from this by the more ovate contour, the last whorl being less contracted below; besides, the columella is much more strongly arched, and the granulation appears much coarser on the penult. whorl and upper half of the last (*Pfr.*).

18. A. HORTENSIÆ Morelet. Pl. 6, figs. 7, 8, 9.

Shell ovate, inflated, thin, pellucid, glossy, granulose-decussate. Brownish-green, streaked lengthwise with brown. Spire acutely conic, short, the suture deep. Whorls 6, convex, the last inflated, wrinkle-striate at the base, smooth anteriorly, more than half the total length. Columella regularly arcuate, pallid, abruptly truncate. Aperture oval, opaline within; peristome unexpanded and acute. Length 32, diam. 19 mm. (*Morel.*).

West Africa: district of Huilla, in the province of Benguela; between Lopollo and Lake Ivantala, 5,000 ft. elev.

Achatina hortensiæ Morel., Journ. de Conchyl., 1866, p. 159; Voy. Welwitsch, p. 74, pl. 4, f. 3.—Pfr., Monogr., vi, p. 216.

With the sculpture and coloration of the large Achatinas, this species is remarkable for its small size, fragility and short spire. The granulation does not extend below the periphery of the last whorl.

Ancey has figured a shell from Ibahi, Ugogo, having much the appearance of this species, but it is said to be similar to *A. granulata* in sculpture and coloration (J. de C., 1902, p. 277).

Group of A. occidentalis.

19. A. OCCIDENTALIS Pilsbry, n. sp. Pl. 45, figs. 1, 2.

Shell ovate-conic, rather thin but strong, *pure white under a thin straw-yellow cuticle,* which is absent from the early whorls. Spire rather long and straightly conic, the apex obtuse. First whorl smooth, the next faintly rippled, the rest of the whorls closely and finely striate, the striæ more or less irregular or anastomosing, decussated. On the last whorl the striæ are coarser, and obsolete except near the suture, giving place to very weak, coarse wrinkles; and the spirals disappear except near the suture, where they are rather weak. Whorls 8½, convex, the last rather inflated below. Aperture ovate, bluish-white within. Columella narrow, white, concave above, very narrowly truncate below, a small ridge, terminating at the basal notch, behind it. Parietal callous a transparent film. Outer lip brownish at the edge. Length 70, diam. 34, length of aperture 34.5 mm.

West Africa: Corisco Island.

This rather glossy white species is distinguished by its rather long spire, quite sinuous columella which is only narrowly truncate, and the small aperture, less than one-half the length of the shell. The last whorl is smooth except near the suture.

20. A. ALBICANS Pfeiffer. Pl. 19, fig. 30.

Shell ovate-conic, thin, longitudinally striate, somewhat decussate with spiral lines which are obsolete below the middle of the last whorl, diaphanous, slightly shining, whitish. Spire pyramidal, a little obtuse, the suture submarginate. Whorls 6½, somewhat convex, the last a little longer than the spire, slightly tapering basally. Columella vertical, rather narrow, horizontally and shortly truncated above the base of the rhombic-semioval aperture. Peristome simple, unexpanded, the basal margin slightly arcuate. Length 46, diam. 23 mm., aperture 25 x 12.5 mm. (*Pfr.*).

West Africa (Cuming coll.).

A. albicans PFR., P. Z. S., 1851, p. 259; Monogr., iii, p. 487; Conchyl. Cab., p. 320, pl. 26, f. 3.

A small white species, not closely resembling any other from West Africa, and known by the original specimen only.

Group of A. pfeifferi (Section *Pintoa* Bgt.).

Pintoa BGT., Moll. de l'Afrique Equatoriale, p. 80, 1889.

Slender, elongated shells, with the contour of *Limicolaria.* Apex obtuse and rather large; the nepionic whorls are smooth, the following whorls decussate below sutures. Aperture small.

Bourguignat established this group for *A. pfeifferi, semidecussata, capelloi, zebriola, polychroa,* and *colubrina.* Removing the second of these species, the remainder form a moderately natural group, distinguished by their small size and slender contour. The type of *Pintoa* is *A. pfeifferi.* Perhaps *A. ellioti* Smith, an East African species, and *A. livingstonei* M. & P., of Bechuanaland, belong here also.

21. A. PFEIFFERI Dunker. Pl. 38, figs. 25-29.

Shell ovate-turrite, rather solid, glossy; dirty white or buff, ornamented with longitudinal brown flames and streaks, covered with a yellowish cuticle. Spire long, the apex obtuse. Whorls 8 to 9, a little convex, obsoletely longitudinally striated, the upper ones very obsoletely decussate below the suture, the last whorl nearly two-fifths the whole length of the shell. Aperture oval; columella very arcuate; peristome acute. Alt. nearly an inch and a half. Alt.: diam. as 100:35 (*Dkr.*).

West Africa: Loanda, on sandy hills, not common (Dr. Tams).

Achatina pfeifferi DKR., Zeitschr. f. Malak., 1845, p. 163; Index molluscorum quæ in itinere ad Guineam Inferiorem collegit Georgius Tams Med. Dr., p. 7, pl. 1, f. 39, 40 (1853).—PHILIPPI, Abbild., ii, p. 214, pl. 1, f. 2.—PFR., Monogr., ii, 259; Conchyl. Cab., p. 334, pl. 29, f. 4, 5 (bad).—REEVE, C. Icon., v, pl. 1, f. 1.—MORELET, Voy. Welwitsch, p. 71.

This is one of the narrowest species of *Achatina.* It has the general appearance of *Limicolaria.* The initial whorl and a half are smooth; then follow several very finely, densely striate whorls, the striæ cut into long granules by incised spirals. This decussation usually disappears wholly from the last whorl or two, but sometimes persists just below the suture. The oblique stripes of the surface usually are abruptly replaced on the last whorl by narrower vertical streaks. Two specimens of the series before me measure:

Length 36, diam. 14, apert. 15 mm., whorls 8½.

Length 42, diam. 14.5, apert. 14 mm., whorls 9.

Dr. Welwitsch reports this agate snail as of frequent occurrence on the margins of the small lakes of Quicuje (Loanda), where they bury themselves very deeply in the sand in the dry season. Large ones attain a length of 48, breadth 10 mm., with 9 whorls.

A. ivensi was described from one specimen, probably not quite adult. It is evidently very closely related to *A. pfeifferi,* and I believe identical. It was collected by Capello and Ivens, who explored in the Zambesi valley, but who probably touched at Loanda on their voyage to or from Portugal. No locality was given by them for the species. The original description follows:

A. ivensi Furtado. Pl. 19, figs. 28, 29. Shell ovoid, elongate, solid, glossy, ornamented with fine and close growth-lines, and below the suture, spiral striæ forming a fine decussate-granulation. Whorls 8, convex, the summit relatively quite large and obtuse; suture well marked, white, strongly plicate and bordered. Coloration of oblique lines and flammules of a dark chestnut color on a waxen-white, bluish or yellowish ground; these lines being arrested on the face of the last whorl by a sort of growth-arrest or varix, after which the flames begin vertical, gradually becoming oblique again. The stripes cover more and more of the surface, so that on the back of the last whorl there appear to be whitish lines so disposed on an almost black-chestnut ground as to produce an elegant and characteristic *delta* design. The aperture is ovoid, bluish-white, glossy inside and showing the external pattern through. Right margin simple and sharp; columella very strongly arcuate; on the parietal wall a mere trace of callous. Length 33, diam. 12.5, aperture 13 x 7 mm. (*Furtado,* Journ. de Conchyl., 1886, p. 145, pl. 6, f. 2).

22. A. ZEBRIOLATA Morelet. Pl. 6, figs. 13, 14.

Shell ovate or elongate, obsoletely and irregularly striate, a little glossy, whitish-fulvous or gray, painted with scarlet, sinuous, longitudinal or oblique stripes. Spire elongate, the apex rather obtuse, the suture impressed, in the last two whorls generally margined. Whorls 8 to 8½, a little convex, the last three-sevenths the total length. Columella arcuate, slightly truncate, nearly reaching the base. Aperture elliptical, milk-white within, showing the bands through; peristome acute and unexpanded. Length 35, diam. 15, aperture 14½ x 9½ mm. (*Morel.*).

West Africa: Golungo-Alto, on aquatic plants on the Rio Quiapose, not far from Sange, Angola (Dr. Welwitsch). Malange on the Quanza (Mechow); Malash on the Kassai (Buchner).

Achatina zebriolata MOREL., Journ. de Conchyl., xiv, 1866, p. 158; Voy. Welwitsch, p. 72, pl. 3, f. 1.—PFR., Monogr., vi, p. 219.—v. MART., Jahrb. d. D. Malak. Ges., ix, 246.

23. A. POLYCHROA Morelet. Pl. 5, figs. 2, 3, 4, 5.

Shell oblong-conic or fusiform, rather solid, plicatulate-striate, and somewhat decussated in places by lightly-impressed spiral lines. Whitish or fulvous, variously painted with wide chestnut flame-like or zigzag stripes, confluent at the base, and spots of the same color. Spire long, the apex rather acute; suture submargined. Whorls 9, a little convex, arcuately plicatulate-ribbed below the sutures, the last whorl a little more than two-fifths the whole length, usually obliquely striped with descending stripes. Columella somewhat twisted, straight, abruptly truncate, nearly reaching the base. Aperture truncate-oval, somewhat channelled, glossy-calloused inside. Length 44, diam. 18 mm.; aperture 20 x 10 mm. (*Morel.*).

West Africa: Angola, in the district of Pungo-Andongo, especially near the *salines* of Dungo. Malange (Buchner).

Achatina polychroa MOREL., Journ. de Conchyl., xiv, 1866, p. 158; Voy. Welwitsch, p. 72, pl. 3, f. 5.—PFR., Monogr., vi, p. 219.—MARTENS, Jahrb., ix, 246.

Excessively variable in size, color and pattern. Besides the striped forms there are livid whitish shells, uniform or with indistinct brownish streaks, and thin, uniform greenish-brown ones.

In the district of Ambaca, and that of the Duc de Braganza, farther north, there is a larger form, 57 x 25 mm., with the shell reddish or greenish-brown, in rare specimens with dark flames as in the type.

Ancey has referred this species to *Leptocala* (Bull. Soc. Malac. France, v, p. 71, foot-note 5.

24. A. COLUBRINA Morelet. Pl. 4, figs. 24, 25.

Shell ovate-turrite, subfusiform, rather thin, glossy, longitudinally plicatulate-striate; sooty, darker below, ornamented with wavy or angular blackish stripes. Spire turrite, the apex subacute; suture crenulate, pale-margined. Whorls 7½, moderately convex, the early ones more or less granulate, the last tapering downwards, three-sevenths the total length. Columella nearly straight, violaceous-brown, reaching nearly to the base. Aperture oblong semioval, purple-black and pearly within. Peristome thin and unexpanded. Length 55, diam. 20 mm.; aperture 23 mm. long, 10 wide (*Morel.*).

West Africa: district of Ambaca, near the cavern Purica-carambola (Dr. Welwitsch). Malange (Mechow).

Achatina colubrina MOREL., J. de Conchyl., xiv, 1866, p. 157; Voy. Welwitsch, p. 70, pl. 4, f. 1.—PFR., Monogr., vi, p. 219.—MARTENS, Jahrb. D. Mal. Ges., ix, 246.

A species of long, slender contour and dark coloration. Spiral striæ are wholly wanting in some individuals, and when present they rarely pass beyond the penult. whorl.

25. A. SYLVATICA Putzeys. Pl. 17, figs. 14, 15, 16.

Shell ovate, rather thin, pale buff irregularly marked with dark chestnut stripes, narrow and often broken on the spire, obsolete on the upper whorls, but on the last whorl *broad and dark, confluent at the base*, the *suture margined below with chestnut.* Surface of the *last whorl smooth,* but the intermediate whorls of the spire are finely decussate-granulate below the sutures. Whorls 6½, the first 2½ smooth, more or less worn and in fully adult shells sometimes truncate. Aperture ovate, milk-white within, but showing the dark markings more or less distinctly. Columella subvertical, narrow, brownish, obliquely truncate; lip thin, narrowly dark-edged; parietal callous thin, transparent. Length 33, diam. 17, aperture 17 mm.

Congo Free State: Forest of Musungu Kifuluka below Nyangwe, zone of Manyema.

Achatina sylvatica PUTZEYS, Bull. des Seances, Roy. Soc. Malac. Belg., 1898, p. lxxxiii, f. 19. (Not of Pfr. or Desh. = *Stenogyra.*)

A handsome little species, chiefly remarkable for its smoothness and the broad, basally confluent brown stripes of the last whorl. Fig. 16 is a copy of the original figure.

26. A. CAPELLOI Furtado. Pl. 39, figs. 34, 35.

Shell oval, elongate, turriculate, solid, quite glossy, ornamented with quite regular spiral and longitudinal striæ, crossing at right angles, producing the granulose surface well known in certain species of the genus, but in this one of an extreme delicacy, especially on the upper part of the spire. From the seventh whorl the striæ gradually lose their fineness and regularity, and finally are wholly replaced by strong growth striæ on the lower half of the last whorl. Whorls 9, elegantly convex and slowly increasing, the summit obtuse; suture quite well marked, whitish, strongly plicate and subcrenulate. The coloration consists on the upper whorls of oblique, angular lines or stripes of a vinous-red color, on a whitish ground washed with the same color. These stripes become longitudinal, wider, relatively closer, and of a dark chestnut-brown, on a pale yellow ground, washed with reddish and with golden reflections, on the ventral surface of the last whorl. Aperture ovoid, piriform, bluish within, the right margin simple and sharp, columella feebly arcuate, whitish; a thin bluish callous on the right margin. Length 65, diam. 26, aperture 27 x 13.5 mm. (*Furtado*).

Plain before Quintum (Capello & Ivens).

Achatina capelloi Furtado, Journ. de Conchyl., 1886, p. 143, pl. 7, f. 2.

Resembles somewhat *A. colubrina* Morel., but differs in proportions and the vivacity of its coloring, and by the granulation. *A. perfecta* Morel. is larger and not so slender, with a somewhat different color-pattern.

27. A. mollicella Morelet.

Shell imperforate, ovate-elongate, thin, glossy, hyaline, spirally very minutely striate, pale fulvous and zebra-striped with darker streaks, wider on the spire, closer on the last whorl. Spire elongate, the apex obtuse. Whorls 6, a little convex, parted by an impressed suture, the last whorl inflated, tapering basally, longer than the spire. Columella narrow, somewhat twisted, nearly straight, obliquely truncate. Aperture semioval, pearly within, the margins joined by a superficial callous, right margin arcuate, thin and unexpanded. Length 18, diam. 12 mm.

West Africa: Guinea (Capt. Vignon).

A. mollicella Morel., J. de C., 1860, p. 189.—Pfr., Monogr., vi, 216.

Referred to *Leptocala* by Ancey, Bull. Soc. Mal. France, v, p. 70, foot-note 3; but he does not state that he had seen a specimen.

Group of A. balteata.

Shell large and elongate, granulate or decussate throughout.

28. A. RUGOSA Putzeys. Pl. 34, fig. 12; pl. 33, figs. 8, 9.

Shell rather solid, long-conic, slightly shining, the apex obtuse. Whorls 7 to 8, a little convex, usually marginate, the first smooth, then very delicately granulate; the upper whorls roseate, the rest covered with a brown cuticle, sometimes irregularly marked with dark chestnut flames, wider above the suture; the last whorl oblong, somewhat compressed, obscurely banded, regularly grooved with wrinkles of growth and close spiral lines. Aperture oblong, the lip acute, milky-bluish within. Columella variable, margins joined by a very thin bluish callous. Length 130 to 104, diam. 60 to 46, length of aperture 70 to 56 mm. (*Putz.*).

Congo Free State: forest of Micici, zone of Manyema.

Achatina rugosa PUTZ., Bull. des seances de la Soc. Roy. Malac. de Belgique, 1898, p. lxxxiii, f. 18.—Bull. for 1901, p. lx.

This species has some resemblance to *A. balteata* Rve., but it differs in the sculpture of the last whorl, which is coarsely wrinkled, and covered with a very dense, fine granulation, which on the last whorl is more or less distinctly transformed into a dense, wavy spiral lineolation. The specimens before me (pl. 33, figs. 8, 9) are quite thin and light, and vary in color, one being olivaceous-yellow, marked with broad but indistinct dark red-brown flames, the early whorls pale roseate, while the other is clear yellowish-green with some darker streaks, also becoming roseate and narrowly striped above. Length 110, diam. 48, length apert. 59 mm., whorls 8.

"It was first found in the forests of the Wazimba country, on the right bank of the Lualaba, northeast of Nyangwe, but we have since encountered this Achatine on the same side at Musungu Kifuluka, Nsendwe, Lokandu, Ponthierville, and we have received a specimen from Stanley Falls" (*D. et P.*).

29. A. BALTEATA Reeve. Pl. 4, fig. 27.

Shell acuminately oblong, somewhat fusiform, rather thick. Whorls 8 to 9, slightly *plicately striated,* very *closely min-*

utely granulated. Columella peculiarly arched and twisted, abruptly truncated. Yellowish, stained towards the apex with chestnut longitudinal bands and encircled about the middle with a rather indistinct interrupted spiral band; columella and interior of the aperture bluish-white (*Reeve*).

Length 140, diam. 67, length of aperture 75 mm.

Length 108, diam. 49, length of aperture 57 mm.

West Africa: banks of the river Gambia (Cuming coll.); Free Town, Sierra Leone (U. S. exped.); forests of Golungo Alto and in the district of Novo Redondo, Benguela (Welwitsch). Gabun (coll. A. N. S.). Chinchoxo on the Loanda coast (Mechow).

Achatina balteata RVE., Conch. Icon., v, pl. 2, f. 7 (Feb., 1849).—DESH. in Fér., Hist., ii, p. 164, pl. 132, f. 3-5.—PFR., Monogr., iii, p. 487; Conchyl. Cab., p. 304, pl. 11, f. 3, 4.—MORELET, Voy. Welwitsch, p. 65.—STEARNS, Proc. U. S. Nat. Mus., 1893, p. 326.—MARTENS, Jahrb. D. Mal. Ges., ix, 245.

The surface of the last whorl has the appearance of being covered with a rough, fibrous epidermis, caused by the peculiar sculpture seen under a lens. The fine folds are densely granulose, while the intervals are mainly smooth and glossy. The whorls of the spire have an excessively fine, even and beautiful sculpture of minute granules in spiral rows. The first whorl or two are smooth and whitish. There is no change of sculpture at the periphery. The shell is quite heavy for its size.

The enormous length of coast along the Gulf of Guinea separates the northwestern range given by Reeve and Stearns for this species, from the southern given by Morelet; but the locality Gabun lies between the extremes. A series of specimens before me from Gabun indicates that *A. infrafusca* is an extreme form, which intergrades with typical *balteata*. D'Ailly found only the allied *A. iostoma* in the Kamerun collections studied by him.

Dr. Welwitsch reports that in Benguela the blacks use this species, as well as *A. monetaria*, for the coinage of "*quiranda*" currency.

29*a*. Var. INFRAFUSCA v. Martens. Pl. 4, figs. 22, 23.

Shell fusiform-ovate, imperforate, rugose-striate, granulated throughout, the granules in spiral series. Tawny above, the suture and periphery painted with more or less wavy or short chestnut stripes, uniform chestnut below, some darker spots in places where the two colors join. Spire conic, the suture simple. Whorls 8½, nearly flat, the first two white, the following with numerous stripes. Aperture occupying somewhat less than half the length, ovate, but obliquely contracted above and below, bluish inside. Peristome thin, unexpanded, dark brown inside. Columellar margin somewhat arcuate, bluish, narrowed below and then transversely truncated. Length 120, diam. 60, aperture 59 x 32 mm. (*Mart.*).

West Africa: mouth of the Gabun river (Dr. Buettner).

A. dimidiata v. M., Conchologische Mittheilungen, iii, p. 17, pl. 42, f. 1, not of Smith.—*A. infrafusca* MARTENS, Beschalte Weichthiere D. Ostafr., p. 89, 1898.

"Recalls *A. balteata* Rve. from Gambia in many respects, but differs by the coloring, which resembles more that of *A. tincta* Rve., which, however, has a different form and sculpture" (*Mart.*).

The shells from Gabun before me are partly typical *infrafusca*, partly intermediate between that and typical *balteata*.

30. A. IOSTOMA Pfeiffer. Pl. 17, fig. 18; pl. 42, fig. 10.

Shell fusiform-ovate, thin, evenly granulate throughout, slightly shining; fulvous, ornamented with obscure, wide, subangular streaks. Spire conic, attenuate above, pallid, the apex obtuse; suture subcrenulate. Whorls 7½, a trifle convex, the last a little longer than the spire, somewhat tapering at the base. Columella slightly twisted, the base obliquely and shortly truncate. Aperture vertical, narrowly semioval, pale lilac and glossy within; peristome simple, the right margin regularly arcuate. Length 128, diam. 56, aperture 72 x 30 mm. (*Pfr.*).

West Africa: Fernando Po (Fraser, in Cuming coll.); Kamerun at Etome, Bibundi, Itoki Na N'Golo and Victoria (Dusen, Sjostedt and Buchholz).

Achatina iostoma Pfr., P. Z. S., 1852, p. 86; Conchyl. Cab., p. 360, pl. 43, f. 7; Monogr., iii, p. 485.—d'Ailly, Bihang, p. 65.—*A. balteata* v. Mart., Monatsber. Berlin, 1876, p. 258, pl. 2, f. 2 (living animal).

A. iostoma is reported as locally abundant in Kamerun. I do not know that the locality Fernando Po has been confirmed in recent years. It is apparently more lengthened than *A. balteata* Reeve, and further differs somewhat in the apparent absence of the remarkable surface wrinkles of that form. I have not seen specimens.

31. A. INÆQUALIS Pfeiffer.

Shell ovate-oblong, thin, irregularly painted with streaks and flames of buff, fulvous and chestnut. Spire long-conic, the apex obtuse; suture crenulate above, provided with a pale crenulate cord on the last whorl. Whorls 7, a little convex, the upper granulate-decussate, the last slightly longer than the spire, somewhat wrinkled, obsoletely granulate at the suture, somewhat tapering basally. Columella slightly twisted, whitish, obliquely truncate. Aperture vertical, angulate-oval, bluish inside; peristome unexpanded, the right margin brown-edged. Length 78, diam. 38, aperture 42 x 21 or 22 mm. (*Pfr.*).

West Africa: Fernando Po (Cuming coll.).

A. inæqualis Pfr., P. Z. S., 1855, p. 99; Monogr., iv, 601.

Known to me by the original description only. It has not been found on Fernando Po by later collectors. Its systematic position in the genus is uncertain.

32. A. ALLISA Reeve. Pl. 35, fig. 17.

Shell elongately oblong, somewhat cylindrical. Whorls 7, obliquely finely granosely striated, finely crenulated beneath the sutures. Aperture rather small. Columella arched, slightly twisted, abruptly truncated. Olive-yellow, here and there irregularly bedaubed with reddish chestnut blotches (*Reeve*).

West Africa: Cape Palmas, Liberia (Cuming coll.).

Achatina allisa Reeve, C. Icon., v, pl. 5, f. 16 (Feb., 1849). —Pfr., Monogr., iii, 489; iv, 603; vi, 218.

Pfeiffer describes the type as rather solid, finely granulose-striate, with impressed-marginate suture. Length 75, diam. 29, aperture 35 x 17 mm. I have not seen the species.

Pfeiffer has described and figured a var. *b*, whitish, with spots and streaks of pale fulvous or subobsolete, from Zanzibar, collected by Rodatz. See Conchyl. Cabinet, *Bulimus*, pl. 44, f. 7, 8, and *Achatina*, p. 367. It cannot well be believed to belong to the West African *A. allisa.*

SPECIES OF EAST AFRICA AND THE LAKE REGION.

LITERATURE OF EAST AFRICAN ACHATINIDÆ. The species of the coast and adjacent islands were for the most part known to the early writers, Bruguiere, Lamarck, Férussac, and others, though much work still remains to be done upon their local races and relationships. The principal workers upon the interior forms have been. E. A. Smith, whose fruitful work upon this fauna has continued from 1880 to the present time (Proceedings of the Zoological Society of London, and in the British conchological periodicals). E. von Martens, whose Beschalte Weichthiere Ost-Afrikas has taken its place as a classical work on this fauna, and M. J. R. Bourguignat, who has treated especially of *Achatina* in two works: Description de diverses espèces terrestres et fluviatiles et de différents genres de Mollusques de l'Egypte, de l'Abyssinie, de Zanzibar, du Senegal et du centre de l'Afrique (1879), and Mollusques de l'Afrique Equatoriale (1889). Mr. C. F. Ancey also has published a number of critical and descriptive notes upon the species of this area, his material, like that of Bourguignat, having been collected largely by the Christian missionaries whose heroic labors are the glory of France.

Group of A. panthera.

33. A. RETICULATA Pfeiffer. Pl. 35, fig. 15.

Shell acutely oblong-ovate, *solid and heavy,* brownish cream-white, broadly streaked with reddish-brown on the spire, less so on the last whorl, sprinkled with dots and spots of the same color. Surface nearly lusterless, strongly plicatulate, the foldlets *coarsely cut into curved granules and festoons by deeply-cut, irregularly-spaced, unequal spiral sulci.* Spire slender above, often with the tip truncate and plugged. Whorls 8 (according to Pfr.), 7 in decollate shells, convex. Aperture ovate, *white;* outer lip regularly arcuate, obtuse, white; columella vertical or concave, abruptly truncate, covered with a glossy white callous which extends over the parietal wall.

Alt. 185, diam. 77, aperture 83 mm.
Alt. 160, diam. 70, aperture 73 mm. (Pfr., type).
Alt. 195, diam. 85 mm. (Martens).
Alt. 195, diam. 80 mm. (Martens).
Alt. 125, diam. 64 mm., whorls 8-9 (Martens).

East Africa: Island of Zanzibar, in the calcareous district on the east coast, near Jambiani, by hundreds, on bushes, etc. (Neumann). Lindi Bay and on the Lindi River (Gibbons, Marie).

A. reticulata Pfr., Proc. Zool. Soc. Lond., 1845, p. 74; Monogr., ii, p. 252; Conchyl. Cab., p. 326, pl. 27, f. 1; Novit. Conch., i, p. 98.—Desh. in Fér., Hist., p. 160, pl. 129.—Reeve, Conch. Icon., v, pl. 2, f. 9.—Dohrn, Malak. Bl., xxi, p. 180.—Gibbons, Journ. of Conch., ii, p. 143.—Ancey, Bull. Soc. Malac. France, ii, 1885, p. 139.—v. Martens, Deutsch-Ost-Af., p. 81.

The most solid, most coarsely sculptured and one of the largest species of the genus. The columella varies from nearly straight and vertical to markedly concave and sinuous.

Mr. Ancey received a sinistral *reticulata* from near the Lindi river, in the south of Zanguebar (Bull. Soc. Malac. France, ii, 139).

34. A. LACTEA Reeve. Pl. 16, fig. 12.

Shell oblong-ovate, solid, of a rich uniform cream color both inside and out, covered with a slight, scattered epidermis. Spire regular, the whorls are very fully striated longitudinally, the striæ rather irregularly following the growth of the shell, and they are characterized by having a number of fine lines running around the upper half. Aperture sub-oblong, the lip rather solid. Length 4.1, diam. 2.1 inch (*Rve.*).

East Africa: Zanzibar (Cuming coll.).

Achatina lactea REEVE, P. Z. S., 1842, p. 55; Conch. Syst., ii, p. 86, pl. 177, f. 6; Conch. Icon., v, pl. 12, f. 41.—PFR., Monogr., ii, p. 252.—MARTENS, Moll. D. O.-Af., p. 82.

Compared with young shells of *A. reticulata* of the same size, this species is seen to widen more rapidly, has more strongly convex whorls, the mouth being therefore wider. The sculpture is similar, but the spiral furrows reach less deeply downwards, not to the following suture on the penult. whorl, and on the last, hardly the half of its height. There is no trace of brown markings (*Martens*). Pfeiffer gives the length as 113, width 54, apert. 53 mm.

35. A. BLOYETI Bourguignat.

Shell elongate, but nevertheless relatively tumid, opaque, rather glossy, the upper whorls smooth, the rest striate, the last whorl coarsely striate-lamellose; whitish, with reddish-chestnut flames. Spire long-acuminate, rather acute at the summit. Whorls 7 to 8, convex, regularly increasing, parted by an impressed suture, the penult. whorl notably swollen towards the right. Last whorl convex-oblong, rounded at the aperture, not half the length of the shell, slowly descending in front. Aperture slightly oblique, lunate, irregularly ovate, rounded outwardly. Columella straight, abruptly truncated, not descending at the base. Peristome unexpanded, acute, the parietal callous white. Length 105, diam. 53, aperture 51 x 31 mm. (*Bgt.*).

Ussagara, in the neighborhood of Kondoa (Capt. Bloyet).

A. bloyeti BGT., Moll. de l'Afrique Equat., p. 82 (1889).

Remarkable for the acuminate spire, relatively very convex whorls, notably the penultimate whorl, as well as the last whorl, strongly swollen, rounded on the right side. This gives the suture between the two whorls a very conspicuous concavity. The columella descends straightly to a truncation well in front of the base of the aperture. Known only by Bourguignat's description.

35*a*. Var. *fatalis* Martens.

Elongated, somewhat ventricose, thick-shelled, closely plicate-striate with shallow spiral lines, which are distinct and rather numerous on the upper whorls, obsolete on the last; whitish with a few brown, vertical streaks. Whorls 8½, convex, regularly increasing, the last long-elliptical with a spiral groove close below the suture, long, somewhat saccate below. Aperture comparatively small, scarcely oblique, obliquely quadrangular; peristome white; columellar margin short, thick, nearly vertical, weakly truncate, the basal margin rounded below the truncation. Parietal callous thin, very pale rose-red. Length 143, diam. of the last whorl 73, of the penultimate 55 mm.; aperture 60 mm. long, and including the columellar margin 47, without it 39 mm. wide (*Mart.*).

On all the steppes below Kilima-Njaro, 700-1100 meters, rather common, the types from near Dechalla lake (Dr. Volkens); steppes at the southern foot of Kilima-Njaro (Dr. Lent).

Achatina fatalis MART., Sitz.-Ber. d. Ges. nat. Freunde zu Berlin, 1895, p. 145.—*A. bloyeti* var. *fatalis* MART., Moll. D. Ost-Af., p. 82.

The thickness of the shell and the general shape remind one of *A. reticulata*. Bourguignat's description of *A. bloyeti* agrees in many particulars, but his words, "grosse striato-lamellosa," indicate a still stronger sculpture, and more stress is laid upon the rounding out of the individual whorls, with pronounced deepening of the suture, than would be the case with our snail.

This shell plays a part in the trials by ordeal of the Wadshagga peoples, the accused whose guilt or innocence is to be proved being compelled to take the poison draught from it.

36. A. MARIEI Ancey. Pl. 13, fig. 45.

Shell thick, ponderous, imperforate, somewhat shining, chestnut-colored, the last whorl chestnut-gray, summit pale, then the upper whorls lightly brown-flamed, the rest hardly streaked or variegated; lower whorls with fold-like growth-lines, the apical ones smooth; posteriorly granulose-decussate, with more or less wide-spaced or obsolete spiral impressed lines, wholly disappearing below the middle. Spire conoid-ovate, the apex minute. Whorls 7, convex, regularly increasing, the suture at first simple, becoming irregularly crenate. Last whorl large, ovate. Aperture whitish inside, the parietal, columellar and outer margins rose-tinted; angular above, convex outwardly; callous thick, pale roseate. Columella arcuate, strong, abruptly and obliquely truncate at the base. Length 169, diam. 84, aperture 97 x 50 mm. (*Ancey*).

Mouth of the Lindi river, southern part of German East Africa (E. Marie).

Achatina mariei ANCEY, Mém. Soc. Zool. France, vii, p. 221, f. 1 in text (p. 222), 1894; Journ. de Conchyl., 1902, p. 275, f. 2.

A. immaculata, with one whorl more, is not so large. *A. mariei* is one of the most massive forms of the genus. It belongs to the group of *panthera* and *layardi,* according to Ancey.

37. A. MILNEEDWARDSIANA Revoil. Pl. 14, fig. 4.

Shell very large, lengthened-oblong, solid, heavy, opaque, glossy, striatulate, the median whorls wrinkled at the suture, the last whorl fimbriate and crispulate-tuberculate, with two spiral lines towards the aperture. Upper whorls uniform whitish-rose, the rest whitish wine-color and ornamented with wide vinous-purple flames of more or less deep tint. Spire long, acuminate, acute at the summit. Whorls 10, a little convex, regularly increasing, separated by an impressed suture, the last whorl relatively moderate in size, less than half the total length, convex, a little compressed below the suture, swollen and rounded at the aperture, suddenly deflexed in front. Aperture scarcely oblique, lunate, rounded subovate, the outer lip quite convex, pearly-white within; peristome unexpanded, obtuse, thickened above at the insertion, rather acute at the base. Columella short, robust, twisted, strongly curved, and conspicuously truncated below, the sinus below the truncation producing a sulcus outside; margins joined by a thick white callous (*Revoil*).

Length 143, diam. 64, aperture 60 x 40 mm.

Length 190, diam. 94 mm. (Ussagara; fig. 4).

Ussagara (Bloyet); Massai steppe, northeastward from Ussandami (Langheld). Also farther north in the Uebi valley above Guelidi, four days' march from Moguedouchou (Mukdischu). Smaller specimens, only 10 cm. long, were found by V. Bettego between Bardera and Brava.

A. milne-edwardsiana REV., Bull. Soc. Malac. de France, ii, p. 98, pl. 5 (1885).—MARTENS, Ann. Mus. Civ. Genova (2), xv, 1895, p. 64; Moll. D. Ost-Afrika, p. 83.

Remarkable for its great size, elongate form and relatively small aperture with very arcuate outer lip, the short, oblique, much curved columella, etc. According to Revoil, the snail buries itself in the sand, leaving only the glossy apical whorls sticking out.

An example collected by Prof. Peters on the Querimba Islands, on the coast of Mozambique, between Quiloa and Mozambique, is very similar to this species. It has been noticed as a white-mouthed *panthera* (*cf.* Martens, Mal. Bl., vi, 1859, p. 214). Probably *A. fulva* Reeve, Conch. Icon., v, pl. 3, fig. 10, is a small form of this species.

38. A. MARIONI Ancey.

Ovate-elongate, thick, solid, buff-whitish throughout, glossy, very much granulated (except 2½ earliest whorls). Spire obtuse at the apex; whorls 8, rapidly increasing, convex, the last longer than the rest, rounded; all but the earliest granose and decussate by irregular spiral and longitudinal striæ, which are especially impressed on the upper part of the last whorl. Aperture simple, oval, truncate, lip not expanded or reflexed, the margins joined by a glittering and very thick callous, the interior part pale buff. Length 113, diam. 66 mm. (*Ancey*).

Elai country, between Brawa and Nyanza Ukerewe (Victoria Nyanza) (Abdou-Raman-Gindi).

A. marioni ANCEY, Le Naturaliste, iii, p. 414 (May 15, 1881); Bull. Soc. Malac. France, ii, p. 140.

Only dead individuals have been collected, but white appears to be the normal color of the shell. It differs from *A. craveni* Smith in wanting flammules and in sculpture. From *A. reticulata* it differs in being unicolored, shorter, more strongly conic, and of greatly inferior size. *A. marioni* has coarse granulation on the last three whorls, but on the lower part of the penultimate whorl this sculpture disappears, or at least is very lightly marked. It is also transformed below the middle of the last whorl into a sculpture similar but much finer, the granules becoming less distinct. This transformation is quite abrupt. The penultimate whorl of *A. marioni* has a tendency to become strongly swollen. The shell is calcareous and very thick, and the columellar truncation is very strong and oblique. Description and notes from Ancey.

39. A. ACUTA Lamarck.

Shell ovate-conic, elongate, the apex acute; very delicately decussate; white with longitudinal red-chestnut flames, close and somewhat widened below, separated above; aperture white. A beautiful shell, quite distinct in shape, and brightly colored. Length 5 inches (*Lam.*).

Sierra Leone (coll. Lamarck).

A. acuta LAM., An. s. Vert., vi, pt. 2, p. 129, no. 5 (April, 1822).—*cf.* PFR., Monogr., ii, 251; DESH. in Fér., Hist., ii, p. 158, pl. 124 A, f. 2; and REEVE, Conch. Icon., v, pl. 3, f. 11.

Under the name *Helix acuta,* Férussac figured a worn specimen of a form of *A. panthera,* in which the broadly streaked pattern is much interrupted by short, spirally-elongate blotches. The mouth and columella are white. The figure measures, length 121, diam. 55, alt. aperture 60 mm. This is sufficiently near the dimensions given by Lamarck to lend some color to the supposition that Férussac figured Lamarck's type; but the brevity of the original description does not permit certain identification, which awaits examination of the type.

Angas has reported *A. acuta* from Ekongo, on the southeast coast of Madagascar (P. Z. S., 1877, 527).

40. A. PANTHERA Férussac. Pl. 38, fig. 31.

Shell acutely ovate, solid and strong, whitish with rather wide purplish streaks shading into the ground-color and bluish on the right, more sharply defined and browner on the left side; more or less marked also with a finer, indistinct dappled or zigzag pattern. Surface smoothish or rather coarsely plicatulate on the last half whorl, indistinctly decussate on the spire, several early whorls being smooth. Whorls 7½, convex. Aperture blue-white within, the outer lip dusky at the edge, columella and parietal callous rose-colored, the columella rather straight, strong and conspicuously truncate.

Length 151, diam. 75, aperture 76 mm. (fig. of Férussac's type).

Length 120, diam. 66, aperture 68 mm.

East Africa: from Zanzibar Island south to Quilimane (Stuhlmann) and to the Lobombo Mts. opposite Delagoa Bay (Penther), and inland to Zomba, at 5,000 ft. elev., near the south end of L. Nyasa (Whyte), Tette on the Zambesi (Peters), and Queensriver at the Victoria mine, near Barberton, eastern Transvaal (Penther).

Madagascar: Port Levin, on the land side of wooded dunes, under dead leaves around the trees and sometimes on bushes (Vesco).

Seychelles: Mahé, common in lowlands and up to 3-400 meters, rare in primitive forest (Brauer).

Mauritius: introduced from Madagascar shortly prior to 1847 (Benson, J. de C., 1858, p. 267).

Reunion (Desh. in Cat. Moll. l'Ile Réunion, 90, referring to Fér., pl. 132, f. 1, 2).

Helix panthera FÉRUSSAC, Prodr., p. 49, no. 349 (nude name); Hist., pl. 126.—*Achatina panthera* DESH. in Lam., An. s. Vert., viii, p. 309; and in Fér., Hist., ii, p. 159.—REEVE, Conch. Icon., v, pl. 3, f. 12.—DOHRN, P. Z. S., 1865, p. 232.—MORELET, Séries Conch., ii, p. 69.—GIBBONS, Journ. of Conch., ii, p. 143.—BOURG., Descript. divers esp. Moll. de l'Egypte, etc., 1879, p. 9, with "Var. B. *Ach. nasimoyensis;*" Moll. de l'Afrique équat., p. 75.—E. A. SMITH, P. Z. S., 1899, p. 589, pl. 34, f. 1 (small form from Zomba).—STURANY, Catal. Südaf. Moll., in Denkschr. K. Akad. Wissensch., lxvii, 1898, p. 56 (592).—MARTENS u. WIEGMANN, Land und Süsswasser-Moll. der Seychellen, in Mittheil. aus der Zoologischen Sammlung des Mus. f. Naturkunde in Berlin, i, p. 22 (shell), pp. 85-92, pl. 4, f. 5, 6 (anatomy).—MARTENS in Möbius' Reise nach Mauritius, Beitr. zur Meeresfauna Maurit., etc., p. 198 (references to occurrence on Mauritius).—ANCEY, Mém. Soc. Zool. Fr., vii, 219 (Shire R., 3 kilo. from S. end Nyasa, Mgr. Lechaptois).—*Achatinus* MONTF., Conch. Syst., ii, p. 418 (fig. only).—? *A. zebra* var. *eburnoides* PFR., see below.—*Achatina pantherina* Fér., NEVILL, Handlist Moll. Ind. Mus., i, p. 145, no. 4.

Achatina lamarckiana PFR., Proc. Zool. Soc., 1846, p. 115; Monogr., ii, p. 253; iii, 483; iv, 601; vi, 213.—*Achatina mossambica* BRANCSIK, 1892-3, Jahresheft des Naturwissenschaftlichen Vereines des Trencséner Comitates, xv, p. 116, pl. 6, f. 2, 2*a*, 2*b* (genitalia, teeth and jaw), pl. 10, f. 2*a*, 2*b* (epiphragm).—*Achatina lechaptoisi* ANCEY, Mém. Soc. Zool. de France, vii, p. 220 (1894).

Typical *panthera* as figured by Férussac is a solid, heavy shell, marbled and streaked in large pattern on a whitish ground, and with the columella and parietal wall pink or rose, the interior pale blue. Pl. 38, fig. 31, is a copy of Férussac's type figure.

Pl. 39, fig. 32, represents a shorter specimen received from Robillard as from Madagascar. This agrees essentially with Pfeiffer's *A. lamarckiana,* described as from Madagascar; but the form known to be from Mozambique is also similar, and it seems likely that the solid, ventricose form is widespread on the calcareous islets and shore. Pfeiffer, at the time he described *lamarckiana,* supposed *panthera* to be a form with white columellar margin.

Brancsik has described the form from the island of Mozambique, similar to Reeve's pl. 3, f. 12, and to my pl. 39, fig. 32, as a new species, under the name *A. mossambica.* His types measure 168 mm. long, aperture 95 mm. to 137, apert. 83 mm. It is stated to differ from *A. panthera* by the *very ventricose* *shape,* with conic, rather acute apex. *Interior roseate or blue, columellar and parietal margin rose-colored.* The shell is *very solid.* In the present state of our knowledge, I do not see that this form can be separated from what Pfeiffer called *lamarckiana.*

A. lechaptoisi Ancey is exactly equivalent to *mossambica,* except in being a little smaller. It was described from Mozambique. The type measured, length 125, diam. 75, alt. apert. 77 mm.

Gibbons, who reports *panthera* from Mozambique and Inhambane, writes that it is common on the island of Mozambique, living on trees and in cavities of rocks shaded by bush. On the mainland, individuals are much larger and more solid. During the dry season it takes refuge in holes in trees—I have seen a dozen or more collected in one cavity. The aperture of the shell is then closed by an opaque epiphragm, non-calcareous, having a longitudinal slit down the middle. The animal is omnivorous, eating meat, other snails when dead, vegetables and paper.

Beyrich found a very short and wide form of *panthera* at Kapaiva, Transvaal, length 115, diam. 68, aperture 66 mm. (*Mart.,* Sitzungsber. Ges. nat. Freunde, 1890, p. 86).

It is likely that *A. panthera* is the shell collected in Madagascar and reported by Bruguiere under the name *Bulimus zebra;* though his account of the species is derived chiefly from the South African form to which the name *zebra* has subsequently been restricted. De Montfort's figure (Conchyliologie Systématique, ii, p. 418) of *Achatinus* was clearly a *panthera,* but his description and synonymy (pp. 419, 420) apply to the Cape species. Sganzin reports "*A. zebra* Lam." as common among bananas in Madagascar. He probably refers to some form of *panthera.*

The relation of *panthera* to *acuta* Lam. is uncertain until the type of the latter can be examined. Férussac's figures of what he identified as *acuta* look like a variety of *panthera.*

Mr. Ancey has recorded a sinistral specimen of *A. panthera,* from Madagascar.

"*Achatina eburnoides* Sganzin" of Pfeiffer, Monogr., iii,

p. 482 (1853), as a variety of *A. zebra,* was based upon *A. éburnoide* of Sganzin, in his Catalogue des Coquilles trouvées aux des iles de France, de Bourbon et de Madagascar, p. 17, in Mémoires de la Société du Muséum d'Histoire Naturelle de Strasbourg, III (1840-1842). Sganzin omitted the Latin name of this species, which was supplied by Pfeiffer. The description follows: I have given this shell the name of the éburnoide because its whorls are projecting and cut into like the Eburnas, instead of being rounded as in the preceding Agate shell [*"A. zebra"*]. For the rest, it has the greatest resemblance to the zebra Agathine, and seems to be only a sport of nature. It has also a little more elongated shape. I found two at Sainte-Marie. This shell is rare and lives with the preceding [*"A. zebra"* of Madagascar].

In Mauritius, where it is said to have been introduced about 1847, *A. panthera* is reported to have almost supplanted *A. fulica* (Dupont, J. de C., 1878, p. 171).

In the Seychelles the typical form—thick-shelled with roseate columella—has been found at Mahé in the cultivated district only.

The specimens from Zomba (pl. 38, fig. 30), near Lake Nyasa, are "small and rather slender in comparison with the typical form figured by Férussac. The largest specimen is only 125 mm. in length, although consisting of 8½ whorls, the number possessed by a large typical example from Mozambique 157 mm. long. A very small specimen, which probably would not have grown larger, has a length of only 93 mm." (*Smith*).

40*a*. Var. *nasimoyensis* Bgt.

This form, which I consider a variety, is relatively very small (length 90, diam. 47, aperture 50 x 26 mm.), differing from the type only in the reduced proportions of every part. The last whorl, however, seems to be more convex and the spire is a little more acute (*Bgt.*).

It occurred at Nasimoya, Zanzibar, with typical *panthera,* 123 mm. long.

There is also a variety from Madagascar (Robillard) which is smaller than the typical form, solid, rather narrow, of a dull livid or purplish shade with narrow, crowded, whitish and darker striæ and some indistinct mottling. Columella and inner edge of lip rose. Outer lip thickened within. Length 115, diam. 55, aperture 59 mm. A similar shell has been figured by Deshayes in Férussac, pl. 132, f. 1, 2.

(*Forms with white columellar margin.*)

Var. NEUMANNI Martens. Pl. 42, fig. 9.

"A very peculiar specimen, found in company with *A. reticulata* at Jambiani, on the island of Zanzibar, by O. Neumann, shows in general the characters of *A. panthera,* but the mouth is pure white and remarkably thickened, the outer margin a little flaring outward, and inwardly having a somewhat uneven lip-like thickening, not sharply defined; the columellar margin is strongly arcuate above, then straight and also very thick, as is also the callous upon the parietal wall. Length 126, diam. 62, aperture 64 mm. Evidently a local form, remaining small, and very old" (*Mart.*).

Another form of *panthera* with white columellar margin and rather small aperture has been described and figured by Pfeiffer, Conchyl. Cab., p. 327, pl. 28, f. 1; also Monogr., ii, 252. This is a much paler shell than *leucostyla.* Prof. von Martens reports two specimens with white columellar margin from Zanzibar (Stuhlmann), the largest 125 x 61 mm., aperture 63 mm. Others are recorded from Bagamoya and near Kilima-Njaro. A number of specimens from "East Africa" are before me. They are smaller and thinner than typical *panthera,* but have essentially the same color-pattern and very thin cuticle, mainly deciduous.

Var. LEUCOSTYLA n. var. Pl. 39, fig. 33; pl. 40, figs. 2, 3.

Shell elongate, rather solid, weakly plicatulate. Last whorl dusky-olive colored with some darker and lighter streaks, violaceous where worn; preceding whorl or two *white, boldly striped with dark brown stripes,* often interrupted; preceding whorls yellowish-white or pink, narrowly striped with brown. Whorls 8½, the first 2½ smooth and glossy, uniform. Aperture sky-blue within, with a dark purple-brown border within the acute lip-edge. Columella and parietal callous blue-white.

Length 143, diam. 63, aperture 72 mm.
Length 107, diam. 50, aperture 56 mm.
Length 105, diam. 53, aperture 60 mm.

Wasin Island, near the coast about 115 kilom. north of the northern end of Zanzibar (Sir Charles Eliot).

Remarkable for its very dark color, 27 specimens collected agreeing in this. The spire shows the typical *panthera* pattern. It is larger than *A. letourneuxi* Bgt., and judging from the description, it is smoother.

Var. CHRYSODERMA Pils. n. v. Pl. 41, figs. 5, 6.

Shell thin and light; white with a few narrow stripes or with diffused patches of red-brown under a bright yellow cuticle on the last whorl, the spire white with broad red-brown streaks, fading on the left. Whorls 7½ or 8. Aperture fleshy-white within, the columella narrow, delicate. Columella and parietal wall covered with a thin white callous.

Length 126, diam. 58, aperture 68 mm.
Length 115, diam. 56, aperture 62 mm.

Mauritius (H. Cuming, 1852).

? *A. acuta* REEVE, Conch. Icon., v, pl. 3, f. 11, not of Lamarck.—? *A. fulica* REEVE, pl. 2, f. 8.

Apparently mature, yet thin and light, with a thin, white columellar callous. The specimens were received from Cuming.

41. A. ANTOURTOURENSIS Crosse. Pl. 35, fig. 16.

Shell oblong-conic, rather slender, thin but moderately strong, *pure white*, retaining small shreds of a thin buff cuticle, immediately behind the lip. Surface but slightly shining, delicately plicatulate and obsoletely decussate above, the last whorl usually smoother. Whorls 7½, slightly convex, the last somewhat flattened between suture and periphery, convexly tapering below; apex obtuse. Aperture white within. Columella white, moderately concave or nearly straight, abruptly or obliquely truncate below; basal lip deeply arcuate. Parietal callous thin, white with a yellowish edge. Length 90, diam. 44, aperture 48 mm.

Antourtour, island of Nossi-Be (E. Marie).

A. antourtourensis CROSSE, Journ. de Conch., xxvii, 1879, p. 340; xxix, 1881, p. 197, pl. 8, f. 1; and in Grandidier, Moll. Madag., pl. 20, f. 3.

A thin, white shell, almost totally denuded of cuticle when adult, and with no trace of flames or streaks except the slight cuticular shreds. Some specimens have a much more arcuate columella than the type.

42. A. FULVA (Bruguiere).

This species differs from the preceding two [*zebra* and *achatina*], with which it has great affinity, (1) in that the shell, though composed of the same number of whorls, is a little more lengthened and less ventricose; (2) the striæ are all longitudinal, inconspicuous, and without any appearance of transverse striæ; (3) the aperture is shorter than half the shell, the left lip is very thin and not colored, and the columella is a beautiful incarnate tint, as in the *B. achatina*, but a little less intense. Finally, it differs by the color of the exterior, which is fallow throughout, without mixture of any other color. All other parts of the shell conform to those of the two species preceding. I do not know the habitat (*Brug.*).

Bulimus fulvus BRUG., Encyclopédie Méthodique, i, p. 359 (1792).—*Helix fulvescens* Fér., Prodr., no. 345.—*Achatina fulvescens* GRAY, Ann. of Philos., n. ser., ix, p. 414.—*cf.* REEVE, C. Icon., v, pl. 3, f. 10. PFR., Monogr., ii, 251; iii, 488; iv, 603; vi, 218. KUSTER, Conch. Cab., pl. 11, f. 3, 4. DESH. in Fér., Hist., ii, p. 157, pl. 124, f. 1, 2. BOURGUIGNAT, Moll. de l'Afr. Equat., p. 78. BOETTGER, Nachrbl. d. D. Malak. Ges., xxii, 1890, p. 87.

The salient features of this species, as stated by Bruguiere —uniform fallow color, absence of spiral striæ, and roseate columellar margin—have not yet led to its identification with certainty or unanimity by conchologists. The species called *fulva* by Reeve and Deshayes seems to be near *A. panthera,* and does not agree with the description of *fulva* in either external coloring or that of the columella. Pfeiffer considered *fulva* to be Reeve's *acuta,* but that form is open to the same objections. What it is Boettger reports from Nossi-Be is not known, as he gives no description, merely stating that the common *Achatina* of Nossi-Be is identical with *fulva* of the British Museum. This form has been called *panthera* by Crosse (Journ. de Conchyl., xxix, 1881, p. 196, referring to Férussac, pl. 126, f. 1, 2, as an illustration). See *A. maculata* Desh.

The name *fulvescens* is merely a variation of *fulva,* and defined by reference to Bruguiere only.

43. A. MACULATA Deshayes. Pl. 44, fig. 2.

Shell ovate-oblong, ventricose, obsoletely striate; apex obtuse. Whorls 8, the last fulvous-brown, ornamented with large brown spots or longitudinal streaks, the upper ones whitish with brown flames. Aperture shorter than the spire; columella twisted, white; lip white within, with a brown internal margin.

It is distinguished from the rest of the large species at first sight by the more elongated shape, less swollen, the aperture especially being shorter, the whorls of the spire longer and more convex; the summit more pointed; and, moreover, it has a special coloration. Covered with an epidermis, it is greenish-brown, interrupted by irregularly-spaced longitudinal white and deep brown stripes. Towards the summit the above-mentioned ground-color alternates with more numerous white stripes, and it changes gradually to brown flames, which diminish gradually and disappear, leaving the summit white. Whorls 9, convex, rounded, smooth or presenting some obsolete longitudinal striæ. The aperture is shorter than the spire. It is dilated, entirely white within, the right margin very thin, acute, and of the same color as the exterior. The columella is entirely white, strongly sinuous in the middle. The truncation of the base is not very deep. The columella is shorter than the anterior part of the right margin. Length 135 mm. Habitat unknown.

Achatina maculata Deshayes, Encycl. Méth., ii, p. 12, no. 10 (1830).—*A. fulva* Desh. in Fér., Hist., ii, p. 157, pl. 124, f. 1, 2.—? *A. fulica* var., Crosse & Fischer, in Grandidier's Histoire Phys. Nat. et Polit. de Madagascar, xxv, Moll., pl. 21, f. 1.

The original account is given above. Deshayes, following Pfeiffer, subsequently referred his species to *A. fulva* (*q. v.*); but it does not agree with Bruguiere's account of that species, and cannot be identical with it. Reeve's *A. acuta* seems to be the same as *maculata*.

44. A. LETOURNEUXI Bourguignat.

Shell much elongated, a little tumid, rather heavy, opaque, glossy, the upper whorls buff, then becoming roseate, the median whorls whitish, the last olivaceous-buff; ornamented with reddish-chestnut flames (except on the upper whorls), on the last whorl obscure rufous-subolivaceous. Smooth at the apex, the rest of the whorls increasingly striate and plicate, the last one lamellose, especially at the sutures; finally the median whorls are very sharply decussated with very minute sulci. Spire produced, elongate, acuminate, the apex rather obtuse. Whorls 9, a little convex, regularly increasing, the lower ones separated by a sulcate suture. Last whorl oblong-convex, relatively of moderate size, less than half the total length. Aperture nearly vertical, oval, pearly whitish inside, the outer margin arcuate-convex. Columella arcuate, tapering below and moderately truncated. Peristome acute, pale reddish-chestnut in the outer margin. Length 118, diam. 50, aperture 53 x 30 mm. (*Bgt.*).

Zanzibar: environs of Nasimoya.

A. letourneuxi Bgt., Descr. divers esp. de Moll. de l'Egypte, Abyss., Zanzibar, etc., p. 8 (1879).

According to Bourguignat, *A. letourneuxi* approaches *A. panthera,* but is slimmer throughout, larger, less ventricose; its aperture is relatively smaller; the columella is longer, more arcuate, less robust and tapers more towards the base, etc. The species has not been figured.

45. A. IMMACULATA Lamarck. Pl. 11, fig. 35.

Shell very large, ovate-oblong, ventricose, longitudinally sulcate-rugose; fulvous, the apex whitish. Aperture longer than the spire, columella rose-tinted; lip white within, its inner margin brown. Habitat, ... my cabinet. A large and beautiful shell, which seems different from the *Bulimus fulvus* of Bruguière. It is nearly 6 inches long (*Lam.*).

Southeast Africa: Cape Delagoa (Layard); Natal (Krauss); between Lydenberg, Transvaal, and Delagoa Bay (Dr. Wilms); Inhambane, on the ground (Gibbons); Nyasaland (Smith).

A. immaculata LAM., An. s. Vert., vi, pt. 2, p. 128, no. 3 (1822).—DESH., Encycl. Méth., ii, p. 9; in Fér., Hist., p. 158, pl. 127.—PFR., Monogr., i, p. 251; iii, p. 432; iv, 600; vi, 211.—KRAUSS, Die Südaf. Moll., p. 81.—GIBBONS, Journ. of Conch., ii, p. 143.—SMITH, Ann. and Mag. N. H., 1890, vi, p. 393; Proc. Zool. Soc. Lond., 1899, 589; Proc. Malac. Soc. Lond., iii, p. 309, figs. I, II (epiphragm).—STURANY, Catalog., p. 55.—MARTENS, Sitzungsber. Ges. nat. Freunde, 1900, p. 119.

Lamarck's description is given above, and Férussac's figure, copied on pl. 11, fig. 35, is from the size, etc., apparently from Lamarck's type. The specimens before me (pl. 43, figs. 1, 2) are all smaller, with the columella more concave and the aperture notably shorter. They are rather smooth, the spirals being mostly obsolete on the last whorl except just below the suture, where the concave surface is scored by one or several spiral furrows. The general surface is smoother than Lamarck's description seems to indicate. The color is rich chestnut, with numerous pale or whitish streaks, the lip having a rather wide brown and pink internal border, columella and parietal wall rose-color. Other specimens (fig. 2) are striped brown and whitish, lip-border almost absent, the columella and callous flesh-tinted.

These specimens show but slight traces of the spotting, which is indicated minutely on the back of Férussac's figure, and culminates in var. *layardi* Pfr.

Length 115, diam. 62, aperture 65 mm.

Length 120, diam. 65, aperture 66 mm.

This species differs from *A. panthera* in the coloration, in being thinner and more inflated, etc.

In recording it from Nyasaland, Mr. Smith remarks: "None of the specimens hitherto examined are quite like Férussac's figure, in which the aperture is unusually long. The spire also is less conical than in specimens from Cape Delagoa in the British Museum or in the specimens from Nyasaland. The latter have a columella bluish-white instead of pinkish, and are of a darker color, but otherwise fairly normal. *A. layardi* Pfeiffer is a variety of this species, rather more profusely spotted than the type."

45*a*. Var. LAYARDI Pfeiffer. Pl. 12, fig. 39.

Shell subfusiform-ovate, thin, longitudinally plicatulate, ornamented with lead-brown and reddish streaks and some close brown spots often pale-bordered. Spire conic, rather obtuse; suture lightly margined, subcrenate. Whorls nearly 8, a little convex, the upper lightly decussate, the last longer than the spire, ventricose, tapering downwards. Columella lightly arcuate, somewhat twisted, widely truncate, purple. Aperture slightly oblique, angulate-oval, bluish-pearly inside; peristome simple, the margins joined by a purplish callous, the right margin red-bordered inside. Length 139, diam. 66, aperture 83 x 36 mm. (*Pfr.*).

East Africa: Oiba (Layard); on the Lindi river, in southern part of German East Africa (Marie).

A. layardi PFR., Malac. Bl., v, 1858, p. 238; P. Z. S., 1859, p. 27, pl. 43, f. 5; Novit. Conch., p. 153, pl. 40, f. 1, 2; Monogr., vi, p. 211.—*A. lagardi* Pfr., ANCEY, Bull. Soc. Malac. France, ii, p. 140.

The original figure shows a much more concave columella than that subsequently published by Pfeiffer in the *Novitates*.

46. A. ZANZIBARICA Bourguignat.

Shell oblong-tumid, swollen in the middle, tapering towards the ends, not very heavy, in places obscurely subtranslucid, glossy, the upper whorls roseate, the lower three covered with a yellow epidermis, quite fugacious and readily peeling off, darker on the last whorl, streaked towards the apex, elegantly ornamented with fulvous flammules, the median whorls zigzag-flammulate with black-chestnut, confluent flames; the last whorl near the aperture chestnut-olivaceous-flammulate. Early whorls smooth, median ones strongly costate, the riblets decussate on the antepenult. and penult. whorls; the last whorl coarsely plicate, plicæ obtuse, vanishing or blunted in places, and elegantly plicate around the suture. Spire regularly acuminate, relatively but little produced, the apex roseate, obtuse, submamillate. Whorls 8, convex, regularly increasing. Last whorl oblong, ample, more than half the total alt. Aperture slightly oblique, acuminate-oblong, intense blue inside. Columella bluish, nearly straight, slightly twisted, the base abruptly truncate; parietal callous thin, subdiaphanous and bluish. Length 117, diam. 57, length of aperture 65, width 30 mm. (*Bgt.*).

Zanzibar: environs of Nasimoya (Letourneux). Bagamoyo (Stuhlmann); Buloa near Tanga (Eismann); Ussambara near Nguelo (Rolle); Massai Steppe (Langheld), etc., in German East Africa.

A. zanzibarica Bgt., Descript. d. divers esp. Moll. de l'Egypte, etc., p. 5 (1879).—Martens, Beschalte Weichthiere, p. 86.—*Achatina usambarensis* Rolle, Nachrbl. d. D. Malak. Ges., 1895, p. 100 (quoted *A. usambarica* by Martens).

The rather strong sculpture, closely crowded fold-striæ and more or less spaced, not very numerous spiral grooves, the reddish color of the upper whorls, and the rather fusiform shape, the greatest breadth in the *middle* of the last whorl, not dilated sack-like below, are characteristic of this species. The chestnut-brown streaks on a yellow ground are broad though unequal, and often connected by transverse bridges, seldom forked above or decidedly zigzag. The columellar margin is whitish, the interior of the mouth remarkably bluish, with dark stripes showing through (*Mart.*).

In *A. schweinfurthi* the greatest width of the shell is more basal in position.

46*a*. Var. LHOTELLERII Bourguignat.

A species of the same shape as *zanzibarica* and with nearly the same set of characters, differing however as follows: (1) In being smaller throughout, length 97, diam. 49, aperture 56 x 24 mm. (2) By the less ventricose form, (3) the less convex whorls, (4) the shorter, more acuminate spire, (5) the penultimate whorl is more oval-elongate, as well as the last whorl less swollen. (6) The aperture is relatively longer, less wide, of a whitish color inside, with corneous or bluish shades here and there. (7) The outer margin is less convex, especially below, giving the aperture an appearance of being more contracted below. (8) The flammules are more regular, not confluent on the last whorl as they are in *zanzibarica*. (9) The columella is less abruptly truncate at the base (*Bgt.*).

Zanzibar: Nasimoya (Bgt.); also on the mainland, coll. by Conradt, and Mswa, Oukouere (Ancey).

A. lhotellerii Bgt., Descript. div. Moll. de l'Egypte, etc., p. 7 (1879).—ANCEY, Journ. de Conchyl., 1902, p. 273, 274, fig. 1.—*A. zanzibarica* var. *lhotellerii* MARTENS, t. c., p. 86.

47. A. HAMILLEI Petit. Pl. 8, fig. 21.

Shell conic-ovate, ventricose below, painted with wavy chestnut streaks; spire acuminate; whorls 7 to 8, rather rounded, the upper more or less finely decussate, the last rather smooth, margined at the sutures. Columella twisted, truncate, blue-white, the lip simple. Length 90, diam. 50 mm. (*Petit*).

Mojoni, interior of the island of Zanzibar, also Tanga (Neumann); between Simbamweni and Koo-im-Pori, in Usseguha (Lieder); Ussambara (Kirk); Massai-Steppe, near Mkurumo (Berlin Mus.); between Tanganyika and the Zanzibar coast (E. Storms); Nyasaland (H. H. Johnston).

A. hamillei PET., Journ. de Conchyl., vii, 1859, p. 384, pl. 13, f. 3.—PFR., Monogr., vi, p. 212.—SMITH, P. Z. S., 1881, p. 282, pl. 32, fig. 10 (variety); 1899, p. 590.—MARTENS, Beschalte Weichthiere D. Ostafr., p. 86, upper two figures on p. 87.—ANCEY, Journ. de Conch., 1902, p. 273.

The original figure and description are given. It differs from *A. fulica* chiefly by the broader contour and darker last whorl. It is thicker and brighter colored than *A. petersi* (*glutinosa*).

The habitat of *A. hamillei* was unknown to Petit, who thought it probably West African because the type was found with a lot of *A. marginata.* The species was first recognized in East Africa by Mr. E. A. Smith, who gives the following description of the specimens from Usambara:

A. hamillei Petit, var. Pl. 8, fig. 22.

"Shell large, ovate, acuminate above; spire whitish, striped obliquely with brown; last whorl purplish, striped at intervals and covered with an olive epidermis. Sculpture granose, consisting of coarse oblique lines of growth which are very coarse beneath the suture, crossed by spiral impressed lines. Whorls 8, moderately convex. Aperture inversely subauriform, a trifle larger than the spire, bluish-white within. Peristome thin, margined within with purplish-brown. Columella thickened, white, not very arcuate or contorted, somewhat abruptly truncated, united to the lip above by a thickish white callosity."

"Length 130 millims., diam. 62; aperture 69 long, 40 wide."

Professor von Martens writes that the finest specimen taken by Neumann (see above) agrees very well with Smith's figure, but is somewhat larger and shows the oblique callous on the upper part of the columellar margin much weaker. Those taken by Lieder agree nearer with Petit's illustration.

48. A. CASTANEA Lamarck. Pl. 15, figs. 7, 8, 9.

Shell ovate, ventricose, very delicately striate, glossy; chestnut-colored, the apex whitish, sutures margined with a white line, the lip white within. Habitat unknown. My cabinet. The upper half of the last whorl is a beautiful chestnut, while the lower is a lighter red. Length 2 inches 8 lines (*Lam.*).

East Africa: Kilima-Njaro, in the cultivated zone, very common (G. Volkens).

A. castanea Lam., An. s. Vert., vi, pt. 2, p. 130 (1822).—*Helix c.*, Férussac, Histoire Nat. Moll. terr., pl. 125, f. 5.—*A. castanea* Lam., Mart., Beschalte Weichthiere, etc., p. 88, lower two figures on p. 87.

Fig. 8, copied from Férussac, apparently represents Lamarck's type. The species has been unknown for many years, but is recognized by Prof. von Martens in a single specimen from Mt. Kilima-Njaro. This shell agrees well with the original *castanea* except in being larger (pl. 15, figs. 7, 9). It is ovate, acuminate above, weakly plicate-striate with spiral grooves, which are rather numerous on the upper whorls, less so on the penult. and last whorls; pale yellow with rather wide, straight, chestnut-brown streaks, but on the *upper half of the last whorl uniform chestnut*, the lower half lighter yellowish, the colors sharply defined from one another. Interior of the mouth violet-bluish; columellar margin approaching vertical, white, with narrow truncation. Length 97, diam. 50.5, aperture 53 mm. long.

49. A. fulica Férussac. Plates 36 and 37.

Shell oblong-ovate, thin but rather strong, yellowish, more or less profusely streaked with reddish-brown, the ground becoming white and the markings bolder on the spire, early whorls whitish. *Surface glossy,* with slight growth-wrinkles but *no spiral striæ on the last whorl,* the median whorls finely and often obsoletely decussate. Whorls usually 7 to 8, convex, especially the last one. Aperture about half the total length in adult shells, whitish or lilac-tinted within. Columella slightly concave, sigmoid, truncate below, and with the parietal callous, white.

Length 94, diam. 45, aperture 48 mm. (Calcutta).
Length 100, diam. 45, aperture 50 mm. (Mauritius).
Length 86, diam. 44, aperture 43 mm. (Mauritius).
Length 108, diam. 51, aperture 54 mm. (Mauritius).
Length 123, diam. 60, aperture 63 mm. (Madagascar).

Zanzibar, common and generally diffused (Gibbons, Hildebrandt); Madagascar and Nossi-Comba (Crosse); Mauritius (type loc.); Bourbon; Seychelles; Comoro Is. Introduced in Calcutta by Benson, 1847, from Mauritius.

Helix (*Cochlitoma*) *fulica* Fér., Prodr., p. 49, no. 347 (no description; refers with a ? to Lister, p. 578, f. 33); Hist., pl. 124 A, f. 1.—*Achatina fulica* Desh. in Lam., An. s. Vert., viii, p. 297; in Fér., Hist., ii, p. 162; Catal. Moll. de l'ile de la Reunion (Bourbon), p. 90.—Pfeiffer, Monographia Hel. Viv., ii, 254; iii, 488; iv, 603; vi, 217; viii, 275.—Benson, J. de Conch., vii, 1858, p. 266 (naturalization in India).—Reeve, Conch. Icon., v, pl. 3, f. 8*b*.—Morelet, Séries Conch., ii, p. 70 (Madag., Bourbon, Mauritius, Comoros).—Nevill, P. Z. S., 1869, p. 64 (Mahe, Praslin).—Semper, Reisen im Archip. Phil., Landmoll., p. 143 (anat. of Calcutta spec.), pl. 12, f. 17, genitalia.—Morelet, J. de Conch., xxv, 1877, p. 335 (Anjouan, Comoro Is., common, coll. Bewsher).—Crosse, Journ. de Conchyl., xxix, 1881, p. 196 (Nossi-Comba and Madagascar).—Gibbons, Quart. Journ. of Conch., ii, p. 143 (Zanzibar).—Martens, in Mobius' Reise nach Mauritius, p. 197; Beschalte Weichthiere D. Ostafr., p. 89 (Zanzibar); and in V. d. Decken, Reisen in Ostafrika, iii, p. 58, pl. 2, f. 1 (Seychelles).—Crosse et Fischer, in Grandidier's Hist. Phys., Nat. et Polit. de Madagascar, xxv, pl. 20, f. 1.—Pfeffer, Jahrb. Hamburgischen Wissensch. Anstalten, IV, p. 24, 1889 (Zanzibar, Bagamoyo, Stuhlmann).

A. mauritiana Lamarck, An. s. Vert., vi, pt. 2, p. 129 (April, 1822).—Beck, Index, p. 76.—Cuvier, Regne Animal, Moll., pl. 25, f. 1, 1*a* (after Q. & G.).—Quoy et Gaim., Voy. de l'Astrolabe, Zool., ii, p. 152-155, pl. 11, f. 10-15; pl. 49, f. 21 (anat., Mauritian spec.).

Helix borbonica Fér., Prodr., p. 49, no. 346, according to Pfr.; a nude name.—*H. zebrina* Fér., *t. c.*, p. 49, no. 348; nude name.—*Achatina couroupa* Lesson, Voy. autour du Monde La Coquille, Zool., ii, p. 318, pl. 9, f. 2 (1830).—*Achatina zebra* var. *macrostoma* Beck, Index Moll., p. 75, based upon Seba, Thes., iii, pl. 71, f. 4, 5 (1837).—*A. panthera* Crosse et Fischer, in Grandidier, Hist. Madag., xxv, pl. 20, f. 2.—??? *Bulimus lineatus* PERRY, Conchology, pl. 30, f. 5 (bad), 1811.

(*Abnormal or pathologic forms.*)

Achatina fulica var. *e*, *umbilicata* PFR., Monogr., ii, p. 254 (based upon Reeve, C. Icon., pl. 11, f. 8*c*).—NEVILL, Handlist Moll. Ind. Mus., i, p. 145 (Mauritius).—*Achatina rediviva* J. MABILLE, Bull. de la Soc. Philomathique de Paris (9 sér.), iii, p. 57 (1901), Mauritius.—*A. fulica* MARTENS, in V. d. Decken's Reisen in Ost-Afrika, iii, p. 58, pl. 2, f. 1*b*, 1*c* (Seychelles).

A. fulica BRANCSIK, Jahresheft des Naturwiss. Vereines des Trencsener Comitates, xv, 1893, p. 204, pl. 6, f. 6 (genitalia of a scalariform spec. from Bali Bay, Madagascar).—*A. f. scalarioides* NEVILL, Handlist, p. 145 (1878), Mauritius; nude name.

A. mauritiana var. *sinistrorsa* GRATELOUP, Actes Soc. Linn. Bordeaux, xi, 1839, p. 415, pl. 2, f. 6 (good). Madagascar.

A. fulica is characterized by the glossy surface, without spiral striæ on the last whorl, which is quite rounded and convex. It varies widely in markings, but the last whorl of the adult shell is usually obscurely clouded and streaked, while the spire is more broadly marked with irregular stripes. Many small specimens, or those not adult, have the last whorl boldly maculate or striped, as in fig. 18 of pl. 36, and fig. 24 of pl. 37. Pl. 36, fig. 19, represents a specimen from the type locality, and agreeing with Férussac's type figure. Fig. 20 represents a large specimen from Madagascar.

From the fact that *A. fulica* occurs only near cultivated lands, it has been generally believed that its distribution in Mauritius, the Seychelles and Bourbon has been effected by human agency; intentionally, for use as food, or otherwise. No definite record of such introduction is extant, and it probably belongs to the early period of settlement. It is likely that *A. fulica* was originally an East African form, though it may have been differentiated in Madagascar.

Benson took specimens from Mauritius to Calcutta in 1847, and they still strive there; one from the Botanic Garden is figured, pl. 37, fig. 23.

The date of the introduction of *A. fulica,* or as it is locally known to the negroes, *couroupa,* in Mauritius is not so easily settled. At the time of the visit of "La Coquille," 1823 or 1824, it was already "prodigieusement commune" and used for food by the negroes. There was a tradition that the wife of a former governor of the island, suffering from consumption, had been prescribed a bouillon of couroupa, as snail broth was at that time prescribed in France; to supply which a number of the snails had been brought from Madagascar. This is probably to be regarded as one of the ways in which the species *might* have reached Mauritius.

In Mauritius and the Seychelles specimens have been found with an open umbilicus, rugose within; the body-whorl very much shortened, and the columella sinuous but not truncate below (pl. 37, fig. 22). The shell is quite heavy. The first three or four whorls are normal or nearly so. In a specimen described by von Martens the abnormal condition was thought to be traceable to a fracture in the fifth whorl, but in two shells before me no such fracture is visible. I am disposed to think the pathologic condition may be due to a disease of the left lobe of the mantle, possibly owing to some specific parasite of *A. fulica.* It is strange that a similar condition has been observed in no other species of *Achatina.* The names *umbilicata* Pfr. and *rediviva* Mabille were based upon umbilicate specimens.

49*a*. Var. COLOBA Pilsbry, n. v. Pl. 37, fig. 21.

Similar to *fulica* in shape and texture, but differing in the *extremely small size.* Yellowish, copiously streaked with red-brown, the streaks unequal, narrow and straight on the last whorl, wider on the penult.; whorls 7, the last three puckered below the sutures. Length 58, diam. 30.5, aperture 29 mm.

Based upon two adult shells, 54 and 58 mm. long, and a young specimen.

50. A. ERLANGERI Möllendorff & Kobelt.

Shell imperforate, conoidally swollen-oblong, very solid, heavy, indistinctly plicate-striatulate, nearly smooth, rather glossy, white. Spire almost exactly conic, the apex rather acute, glossy, hyaline. Whorls 7½, a little convex, the last large, much longer than the spire, quite convex. Aperture nearly vertical, subauriform, the base somewhat effuse; peristome unexpanded, obtuse; columella rather twisted, obliquely strongly truncate. Length 122.5, diam. 68, aperture 65.5 mm. long, 41 wide (*M. & K.*).

Northeast Africa: Gallaland on the Wabbi river and Ganale, Somaliland (C. v. Erlanger).

Achatina erlangeri M. & K., Nachrichtsblatt d. Deutschen Malak. Gesell., xxxiv, p. 180 (Oct., 1902).

Related, apparently, to *A. chrysoleuca,* but more solid, with a proportionally smaller aperture.

51. A. CHRYSOLEUCA Pilsbry. Pl. 16, fig. 13.

Shell ovate, with conic spire, in general contour resembling *A. hamillei, A. petersi,* etc.; moderately solid and strong, though not very thick. *White,* with a thin golden-brown cuticle, which is deciduous over the greater part of the shell, remaining behind the aperture and in the depressions between longitudinal plications elsewhere; later 1½ whorls immaculate, the next earlier with spaced, somewhat zigzag and rather broad brown streaks, the next earlier narrowly streaked, the streaks straight, these streaked whorls being soiled white. Whorls 6½ (the apex truncated, perhaps 1 or 1½ whorls being thereby lost), moderately convex, the last quite convex. Surface shining, the antepenultimate whorl finely decussate, this sculpture hardly visible to the naked eye, and gradually becoming obsolete, the spirals lost or very weak on the later 1½ whorls, which are somewhat coarsely, irregularly plicatulate above, obsoletely so below. Sutures even above, weakly and irregularly serrate below. Aperture exceeding half the length of the shell, pure white within, subvertical, acuminate above; outer lip rather regularly arcuate, but less curved above than below, thin and acute. Columella *short,* cylindric, very *deeply concave* on the front and the side towards the aperture, abruptly truncated at base, delicate flesh-tinted; parietal wall with a thin, transparent varnish. Length 105, diam. 58 mm.; longest axis of aperture 60, greatest width of cavity 33 mm.

British East Africa: Tulu Didirko, in about lat. 4° 4′ N., lon. 39° 36′ E.)., at 3,580 ft. alt. (Dr. A. Donaldson Smith, March 27, 1895). Type 68,113, A. N. S. P.

Achatina chrysoleuca Pils., Proc. A. N. S. Phila., 1897, p. 357 (Nov. 23, 1897).

An ivory-white shell, inconspicuously marked on the spire, the golden cuticle largely lost from the type specimen, which was collected alive. There is a little prominence at the periphery, and there are some oblique flattened places above it on the last whorl. The columella is very short and sinuous. *A. petersi* is a thinner shell than *chrysoleuca,* differently colored, with finer vertical sculpture and far more spiral grooving on the last whorl.

Dr. Smith collected also a dead, half-grown shell, apparently referable to *chrysoleuca,* at Magois, British East Africa. The type locality is east from Lake Stefanie.

52. A. rodatzi Dunker. Pl. 45, fig. 3.

Shell elongate, ovate-conic, rather thick, milk-white, covered with a very thin olivaceous-tawny epidermis. Spire conic, nude above, the apex rather acute, the suture light, submarginate, slightly crenulate. Whorls 8½, a little convex, longitudinally obsoletely plicate, granose-decussate above, the following whorls more openly reticulate, the last nearly smooth, about as long as the spire. Columella white, slightly arcuate, obliquely and narrowly truncate above the base of the aperture. Aperture subvertical, acuminate-oval, milk-white within; the parietal callous white, spreading inward. Length 134, diam. 60, aperture 72 x 34 mm. (*Pfr.,* from type).

Island of Zanzibar (Rodatz, Gibbons). Bagomoyo; on the way from Kikoha to Rosako, in Usaramo, and near Msere on the Wami shore (Stuhlmann).

A. rodatzi DKR., Zeitschr. f. Malak., 1852, p. 127.—PFR., Novit. Conch., i, p. 97, pl. 27; Monogr., iii, p. 483.—GIBBONS, Journ. of Conch., ii, p. 143.—PFEIFFER, Jahrb. d. Hamburger wiss. Anstalten, iv, 1889, p. 24.—MARTENS, Beschalte Weichthiere D. Ostafr., p. 85.

Distinguished by its rather long form, white shell substance and white mouth.

53. A. SCHWEINFURTHI Martens. Pl. 7, fig. 15.

Shell ovate-conic, solid, lightly striatulate, obsoletely decussate; buff, painted with reddish-chestnut lightning-stripes, narrowing above, widening downwards, almost confluent on the last whorl. Spire long, tapering, the apex a little obtuse; suture marginate, lightly plicatulate. Whorls 8, a little convex, the last moderately attenuate above. Aperture a little longer than the spire, oval, acute above; columella white, arcuate, obliquely truncate; peristome simple, unexpanded. Length 132, diam. 76, aperture 71 x 39 mm. (*v. M.*).

East Africa: Njamnjam-Land, on the mountain Baginse, 5 degrees north latitude (G. Schweinfurth); primitive forest on the northwest spur of Runssoro, between Karevia and Kiviriri, and in the Andetei district west of the Issango river (Stuhlmann).

A. schweinfurthi MARTENS, Malak. Bl., xxi, 1873, p. 40; Beschalte Weichthiere D. Ostafr., p. 85.—PFR., Novit. Conch., iv, p. 141, pl. 132, f. 1, 2; Monogr., viii, p. 272.—JICKELI, Moll. Nordost-Afrikas, p. 150, pl. 6, f. 1 (good!).

The specimens from Runssoro are somewhat larger than that obtained by Schweinfurth, length 132, diam. 76, aperture 71 mm. Dr. Stuhlmann noticed green mites on them and in the lung cavity.

Group of A. glutinosa.

54. A. GLUTINOSA Pfeiffer. Pl. 9, figs. 23, 24.

Shell ovate-conic, rather thin, longitudinally striate, nearly uniform brown. Spire conic, attenuate above, the apex a little obtuse. Whorls 7½, the median ones somewhat decussated with spiral lines, submarginate and deeply striate at the sutures, the last whorl a little longer than the spire, smoothish, with a gummy gloss. Columella plicate-twisted, abruptly truncate basally. Aperture oblique, nearly oval, lilac within, pearly; peristome simple, brown-edged, the basal margin arcuate. Length 98, diam. 45, aperture 55 x 28 mm. (*Pfr.*).

East Africa: Zomba (Johnston); Tette, Mozambique (Peters).

A. glutinosa Pfr., P. Z. S., 1852, p. 86; Monogr., iii, p. 485; Conchyl. Cab., p. 360, pl. 44, f. 1.—E. A. Smith, Proc. Zoöl. Soc. Lond., 1899, p. 589 (including *petersi* Mart.).—*A. petersi* Martens, Malak. Bl., vi, 1859, p. 214.—Pfr., Monogr., vi, 213; Novit. Conch., iii, p. 452, pl. 99, f. 13-15.

A *thin*, dark colored, *glossy* species, with spaced spiral sulci on the last whorl. Fig. 23 is a copy of one of Pfeiffer's figures of *A. glutinosa*, fig. 24 of *A. petersi*. Neither of these figures sufficiently represent the spiral grooves on the last whorl.

Mr. E. A. Smith writes as follows: "I am unable to find any distinguishing characters between this species, said to have been originally obtained in West Africa, and *A. petersi* from Mozambique; and I am of the opinion that the locality 'W. Africa' is one of the many errors of this kind occurring in Mr. Cuming's collection. The species is remarkably constant in coloration, but varies somewhat in ventricosity. The type is 97 millim. in length and 49 in diameter, whereas a more ventricose specimen is the same length but 6 millim. broader, a smaller but adult example from Zomba (88 millim. long and 45 wide) is rather more solid than the typical form."

The wider form, *petersi* Mart. (pl. 9, fig. 24), was described as follows: Shell ovate-conic, thin, perpendicularly lightly wrinkled and traversed by a few spiral impressed lines; nearly uniform fulvous-brown with chestnut variceal streaks, and with a varnish-like gloss. Spire conic, attenuate above; whorls 7, a little convex, the suture of the upper ones simple, in the last whorl granulose by the decussation of wrinkles by impressed lines. Columella deeply twisted, abruptly truncate below, bluish-white. Aperture slightly oblique, oval, lilac within; peristome simple, acute, the basal margin arcuate. Length 95, diam. 53, aperture 54 x 30 mm. (*Mart.*).

A. glutinosa var. *petersi* is almost exactly like some forms of *Burtoa nilotica* (Vol. XVI, p. 300) in color, sculpture and texture, but the spire is more conic and more slender above, and the columella differs. It is possible, however, that *Burtoa* arose from the same Achatinoid stock as *A. glutinosa*.

55. A. PINTOI (Bourguignat). Pl. 41, fig. 8.

Shell ovoid-ovate, ventricose, fragile, pellucid, striatulate except the upper whorls, the last elegantly decussate with spiral lines; uniform pale chestnut, obscurely ornamented with darker interrupted or somewhat fulgurate flammules, whitish towards the summit. Spire rather short, obtusely acuminate. Whorls 6, convex, regularly increasing to the last, separated by a relatively deep suture, the last whorl large, much more than half the length, ventricose, slowly descending at the insertion. Aperture slightly oblique, oblong-ovate, angular above, well rounded below. Peristome unexpanded, acute; columellar margin somewhat curved, rather short, not reaching to the base and abruptly truncated, parietal callous very thin. Length 49, diam. 33, aperture 32 x 19 mm. (*Bgt.*).

Environs of Ugerengere, valley of the Kyngani on the Ukani.

Serpæa pintoi BGT., Moll. de l'Afrique equatoriale, p. 86, pl. 4, f. 4.

56. A. FRAGILIS E. A. Smith. Pl. 9, figs. 25, 26.

Shell ovate, acuminate above, very thin, subpellucid, yellowish-olivaceous, unicolored or streaked with reddish. Spire short, conic, rather obtuse at the apex. Whorls 6 to 7, convex, the upper three pale, smooth, the two following granose sculptured with growth-lines decussated by spiral striæ; last whorl large, inflated, scarcely granulose below the middle, ornamented with strong, oblique, curved growth-lines. Aperture inversely auriform, sky-blue, glossy. Columella slightly arcuate, thin, covered with a very thin callous, narrowly truncate in front; lip very thin, black-margined. Length 75, diam. 43, aperture 47 x 26 mm. (*Smith*).

British Central Africa: Nyika Plateau, 6,000-7,000 ft. elev. (Sir Harry Johnston). M'bwe and Ufipa country (Mgr. Lechaptois).

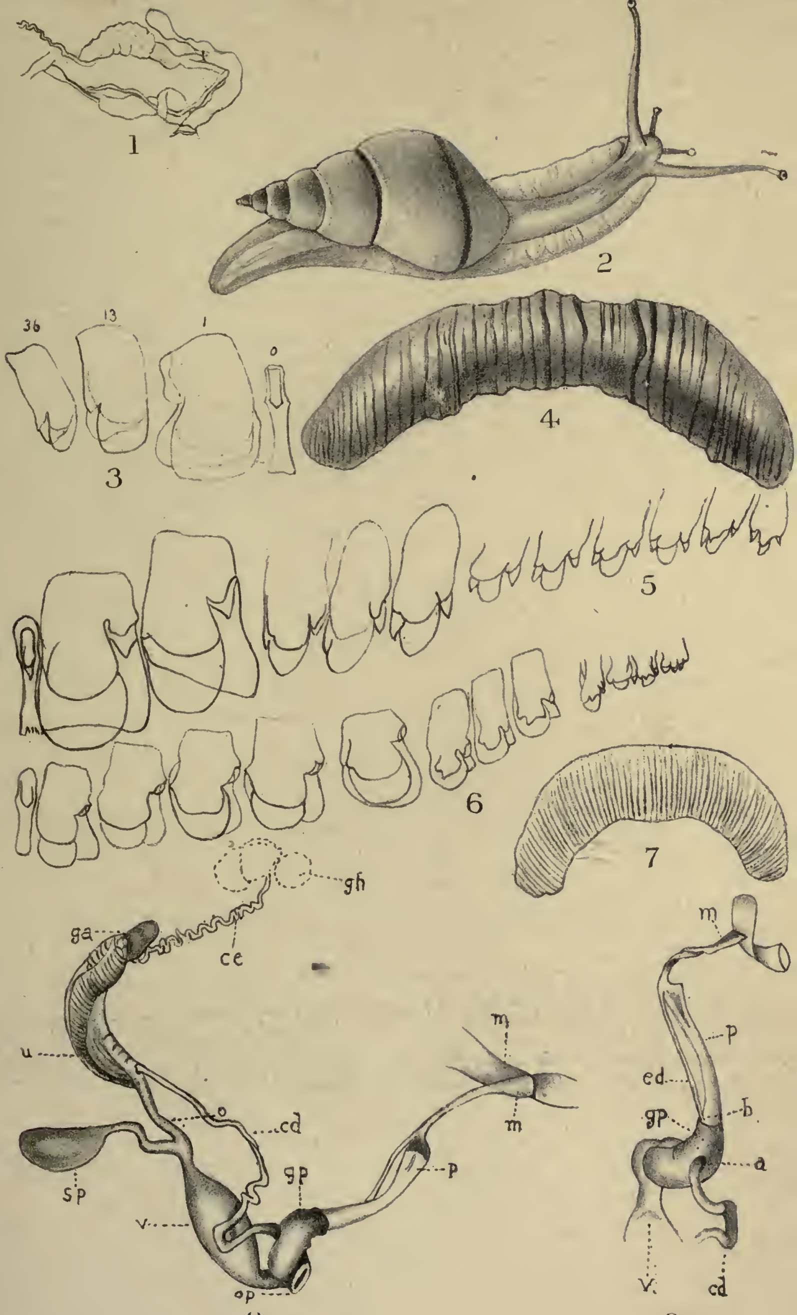
A. fragilis SMITH, P. Z. S., 1899, p. 591, pl. 25, f. 3, 4.—ANCEY, Journ. de Conch., 1902, p. 278, fig. 6.

"This species is remarkable on account of its extreme thinness and lightness. Some specimens are uniformly yellowish-olive, with here and there a darker stripe, marking a period of growth, whilst others, having the same ground-color, are ornamented with numerous oblique and slightly wavy red stripes. These either extend the whole length of the body-whorl, or occasionally disappear upon the lower half. The somewhat coarse regular granulation ceases at a little above the middle, but a few transverse striæ, not sufficient to form a regular granulation of the surface, are traceable below" (*Smith*).

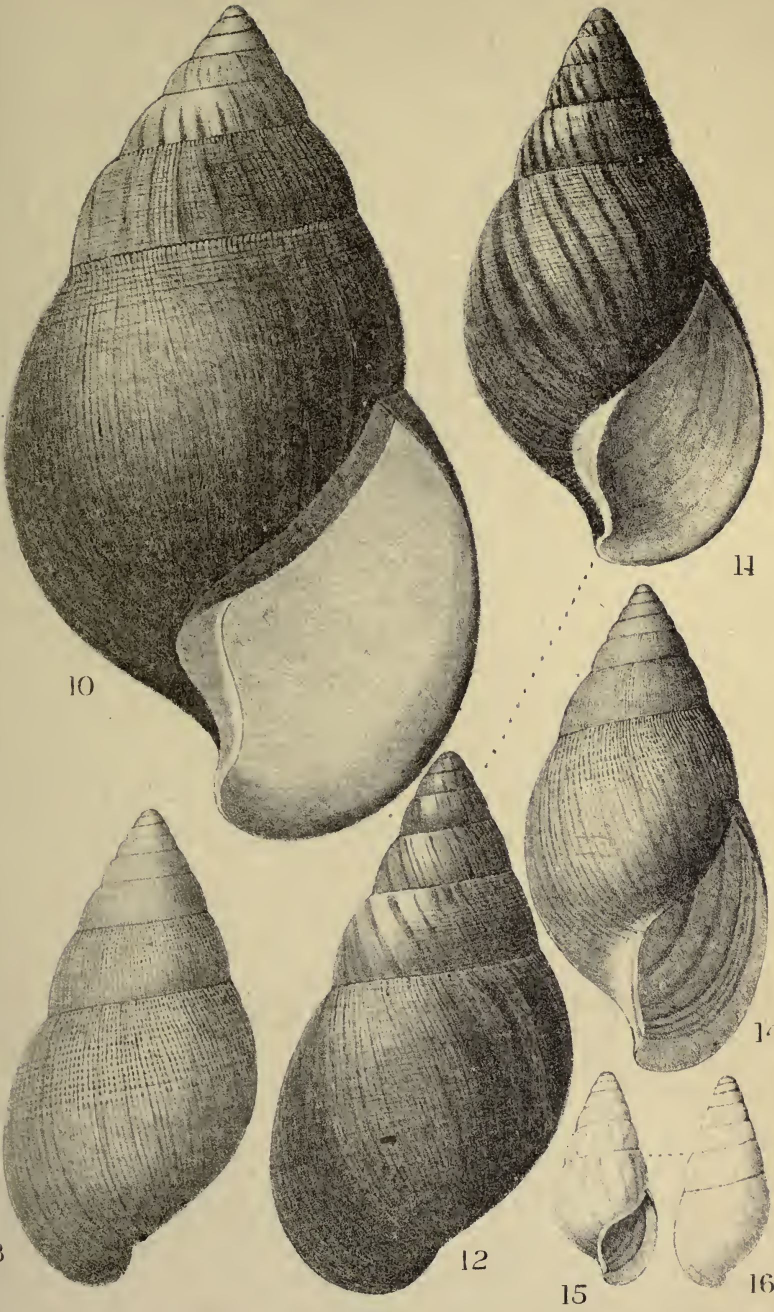
Group of A. craveni.

57. A. GLAUCINA 'Ancey' Smith. Pl. 8, figs. 19, 20.

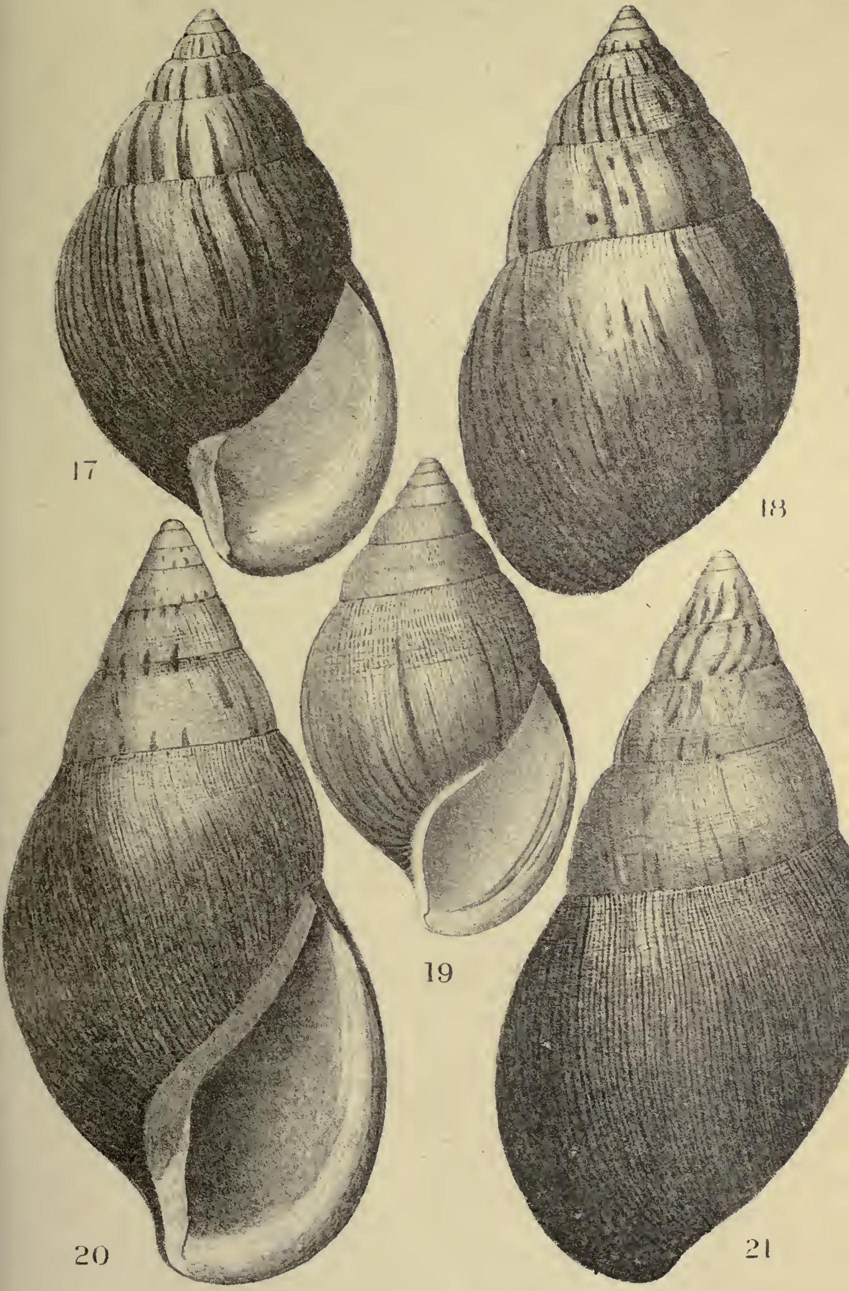
Shell ovate-fusiform, yellowish or reddish, unicolored or sometimes obscurely painted on the upper part of the spire with oblique, wavy rufous streaks. Spire conic, obtuse at the apex, the sides a little convex. Whorls 8, slowly increasing, a little convex, the upper ones very smooth, the rest granulated, the granulation more or less obsolete below the middle of the last whorl. Aperture glaucous or bluewhitish, scarcely half the total length in adult shells, inversely ear-shaped, columella white, lightly twisted, narrowly and obliquely truncate. Length 66, diam. 29, aperture 30 x 16 mm. (*Smith*).


1
2
36
13
1
0
3
4
5
6
7
gh
ga
ce
u
o
cd
sp
v
gp
p
m
m
op
8
m
p
ed
gp
b
a
v
cd
9

Achatinidæ PLATE 2

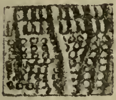

11
10
14
13
12
15
16

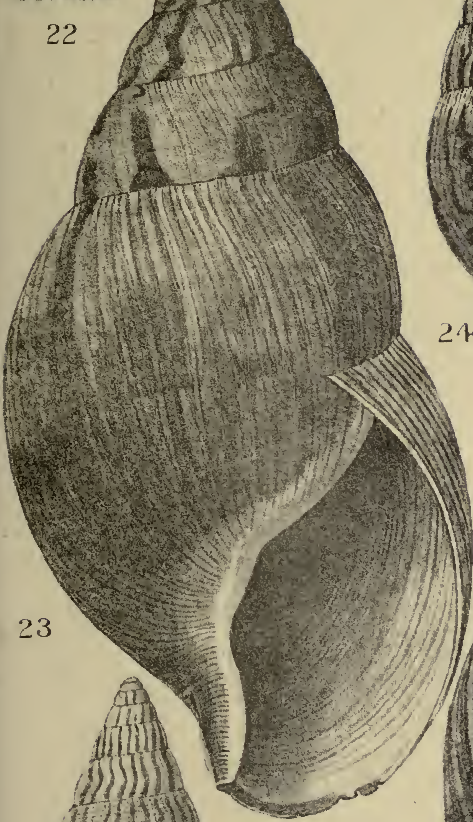
Achatinidæ PLATE 3

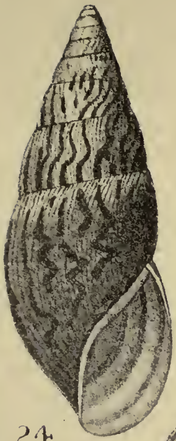

17
18
19
20
21

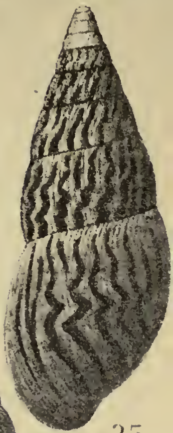
Achatinidæ

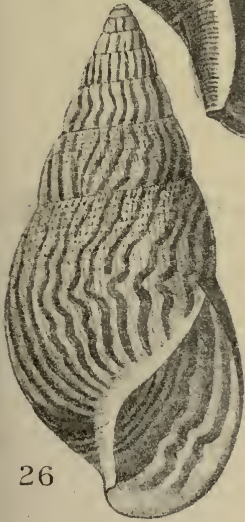
PLATE 4

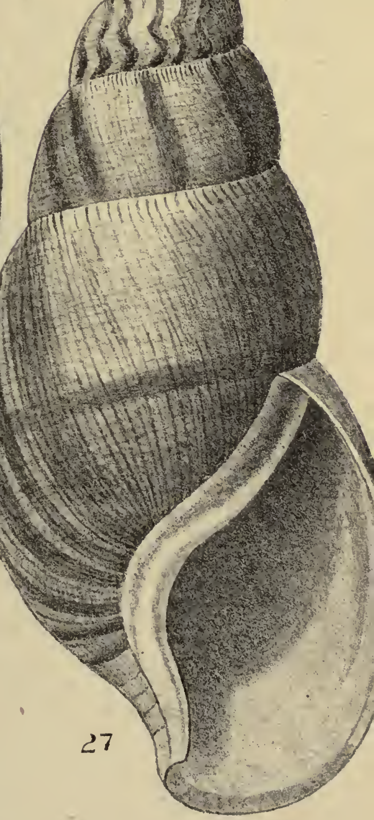

22


23

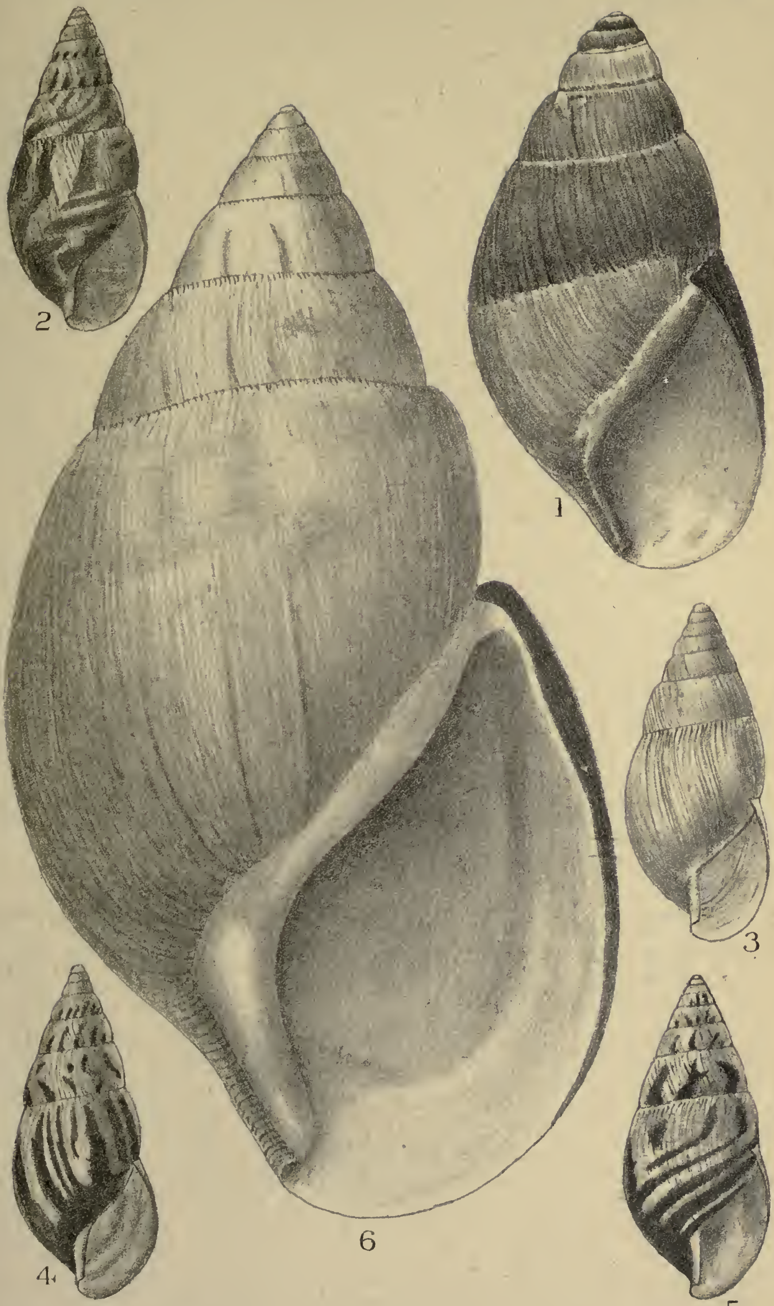

24

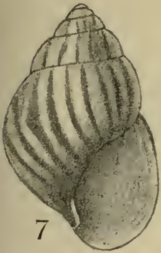

25

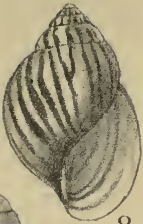

26

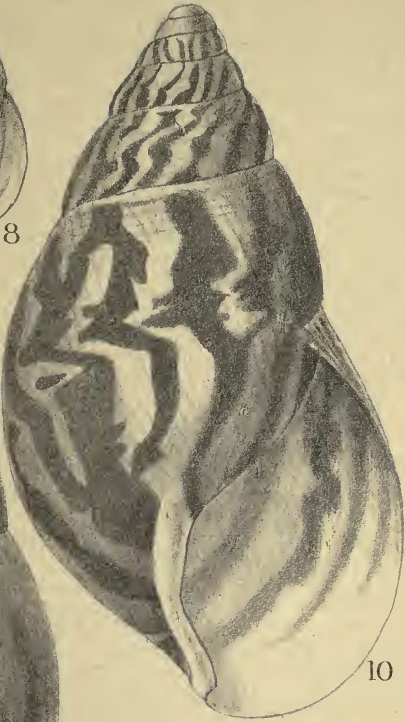

27

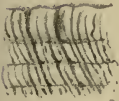
Achatinidæ. PLATE 8.

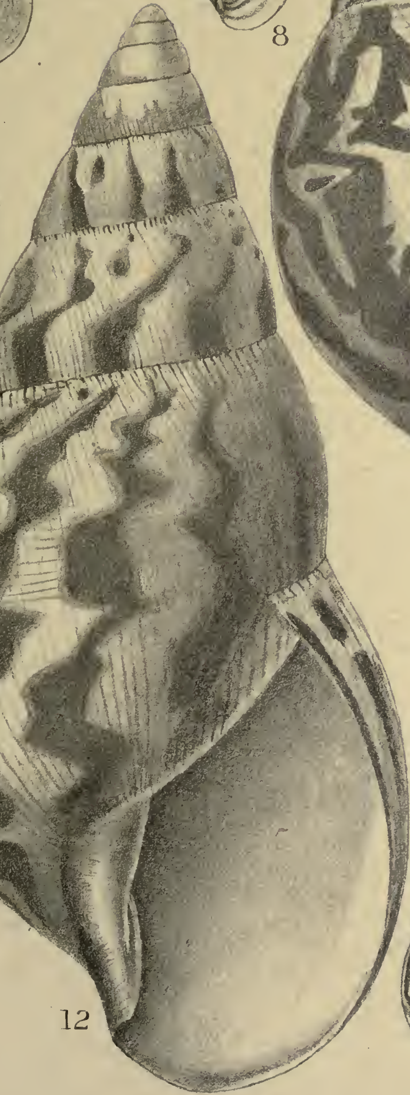


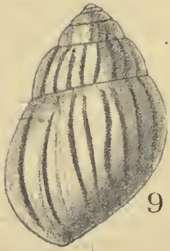

7

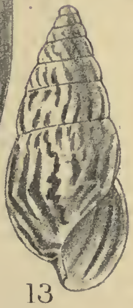

8

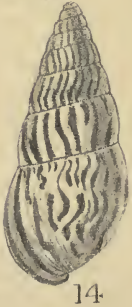

10

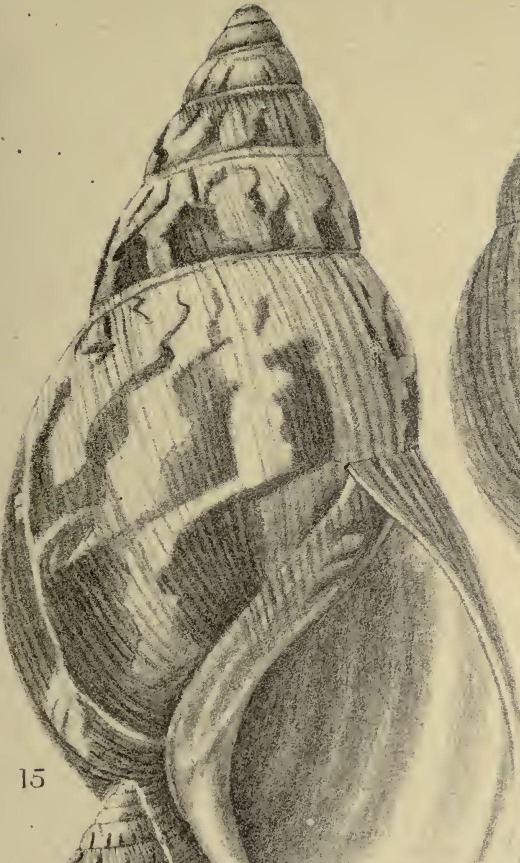

11


12

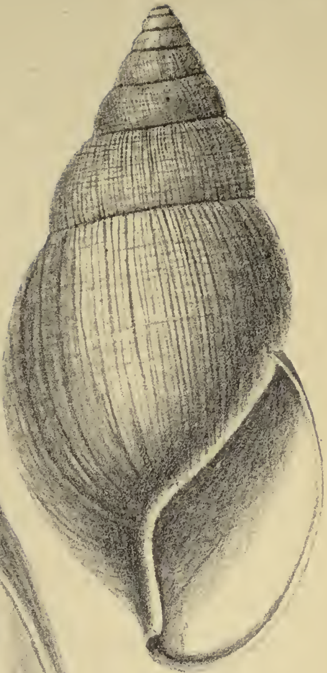

9


13

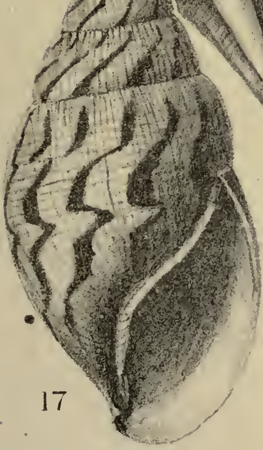

14



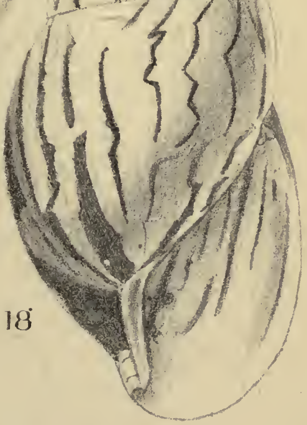
15



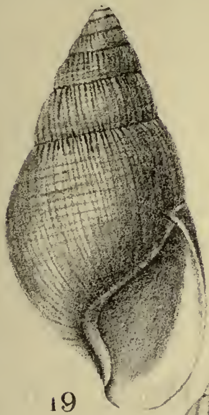
16



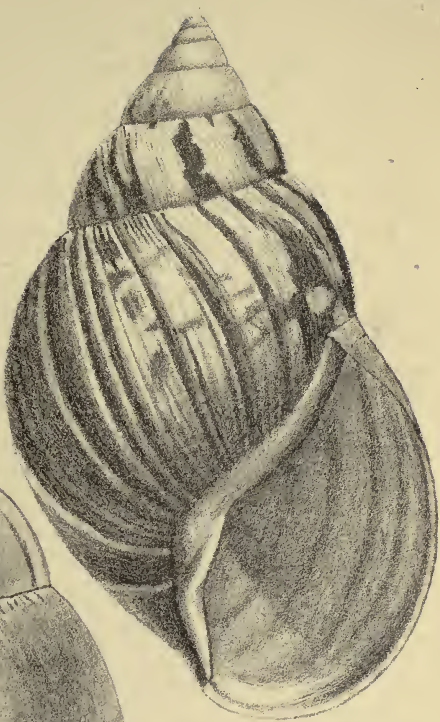
17



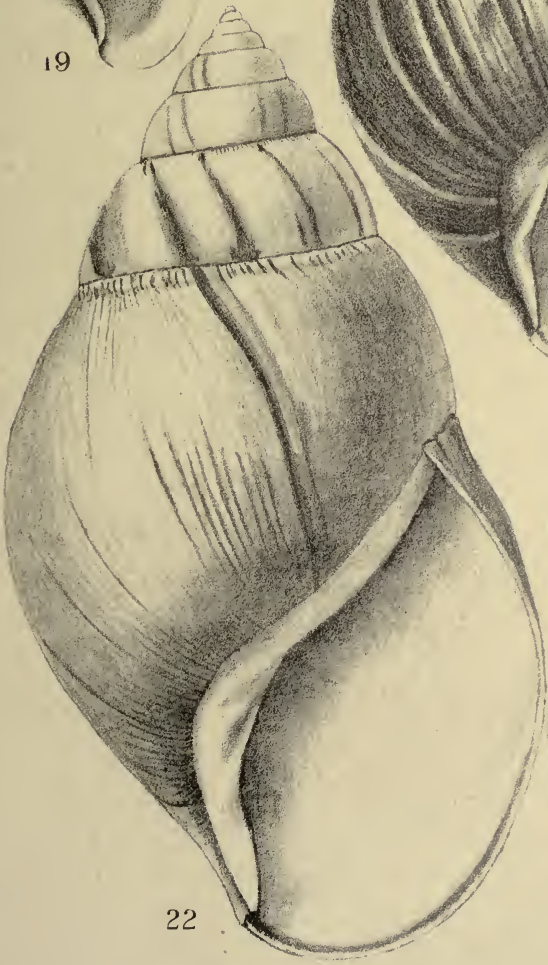
18



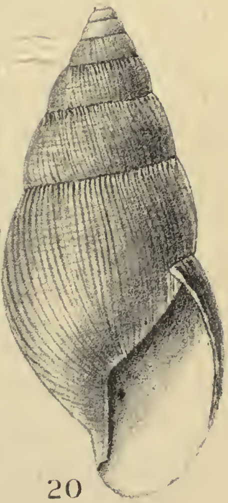
19



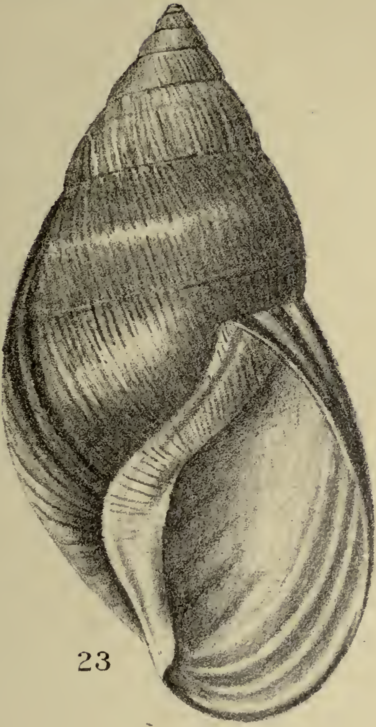
21



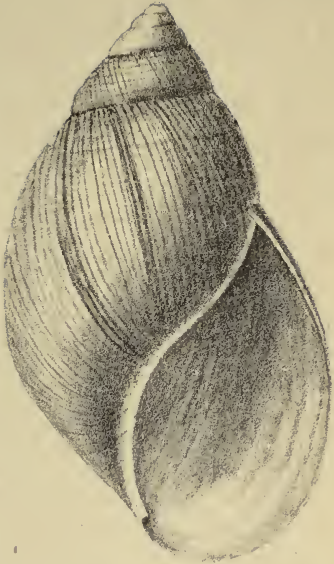
22



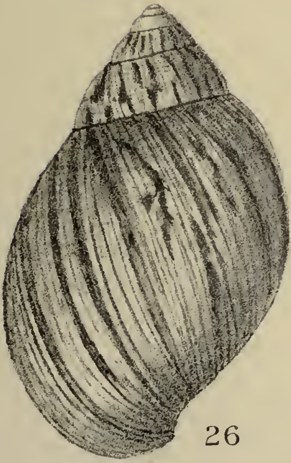
20



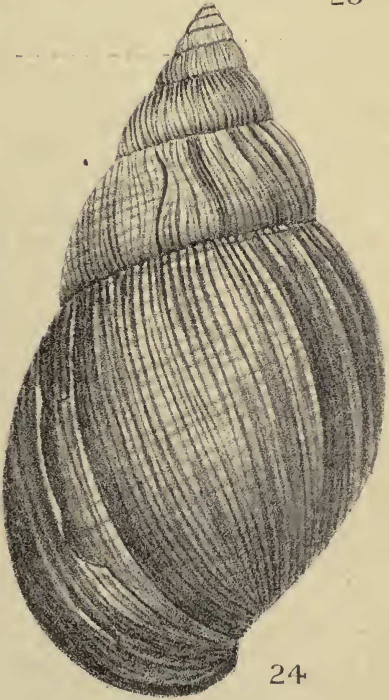
23



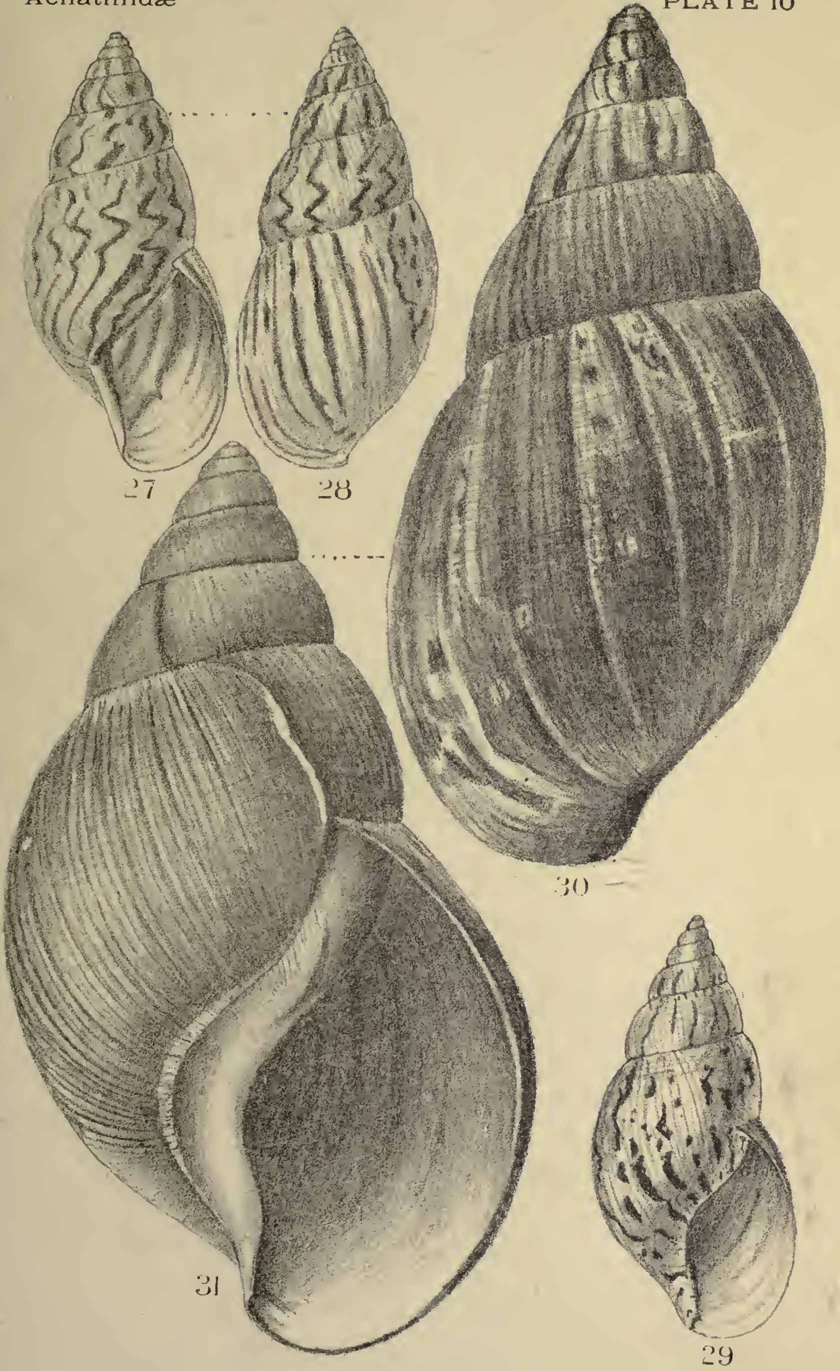
25



26



24


27
28
30
31
29

East Africa: Zomba (Johnston).

A. glaucina Ancey, MSS., E. A. Smith, P. Z. S. Lond., 1899, p. 590, pl. 34, f. 2, 3.

"A smaller species than *A. johnstoni,* with a less tapering and shorter spire, narrower whorls, and rather finer granulation. The color varies from uniform greenish-yellow to rich brown, but some specimens, chiefly of the latter variety, exhibit reddish striping upon the spire. This kind of ornamentation, however, does not appear to extend to the last volution" (*Smith*).

58. A. johnstoni E. A. Smith. Pl. 12, figs. 40, 41.

Shell ovate-fusiform, yellow, uniform or painted with wavy or zigzag stripes of deep reddish-chestnut. Spire lengthened, obtuse at the apex. Whorls 9, the upper three smooth, a little convex, the rest convex, roughly granulated with strong, oblique growth-lines and numerous spiral striæ, the granules almost disappearing below the middle of the last whorl. Aperture small, inversely auriform, blue-white, showing the stripes through. Columella lightly arcuate or rather straight, white at the edge below, obliquely truncate. Length 79, diam. 40, aperture 35 x 19 mm. (*Smith*).

Nyasaland (Sir Harry Johnston).

A. johnstoni Sm., P. Z. S. Lond., 1899, p. 590, pl. 34, f. 4, 5.

"The principal distinguishing features of this fine species are the prolonged spire, the general form and coarse granulation. As in some other species, two varieties of coloration occur in the present form. Some are white, clothed with a glossy yellowish epidermis, here and there varied with darker oblique stripes, indicating periods of growth. Other examples, however, are adorned with more or less oblique, dark reddish-brown, wavy or zigzag-like stripes, which are slender above, becoming broader below. Those on the body-whorl coalesce inferiorly and form a rich brown patch at the base or anterior end. The coarse granulation practically ceases at the periphery, the spiral striæ becoming less pronounced below" (*Smith*).

59. A. CRAVENI E. A. Smith. Pl. 7, figs. 16, 17, 18.

"Shell elongate ovate, somewhat acuminate above, beneath a yellowish epidermis white, ornamented with suberect, slightly wavy, brown stripes. Whorls 8-9, rather convex, rather coarsely granosely sculptured; suture between upper whorls horizontal, between two last more oblique; last whorl descending, smoother upon the lower part. Aperture subpyriform, bluish-white, occupying less than half the shell. Columella not much arcuated, whitish, rather abruptly truncated, connected with the upper extremity of the outer lip by a thin callosity. Length 81 millims., diam. 37; aperture 39 long, 20 wide" (*Smith*).

Between Zanzibar and Lake Tanganyika (Kirk), and on Tanganyika (Bohm *et al.*); Ufipa and M'bwe countries, south of Tanganyika (Lechaptois). Matangisi in Ugogo (Emin Pasha); Massai-steppe, northeast from Ussandami (Langfeld); Nyika plateau, 6,000-7,000 ft., and Malosa, Nyasaland, 6,000 ft. (Johnston); Tumbatu, a small island near Zanzibar (Stuhlmann).

A. kirkii SMITH, Ann. and Mag. N. H., 1880, vi, p. 428 (December, 1880). Not *A. kirkii* Craven, 1880, a species of *Pseudoglessula.*—*A. craveni* SM., Proc. Zoöl. Soc. Lond., 1881, p. 283, pl. 33, f. 11; P. Z. S., 1899, p. 590, pl. 35, f. 1, 2.—CROSSE, Journ. de Conchyl., xxix, 1881, p. 298.—MARTENS, Sitzungsber d. Ges. nat. Freunde, 1891, p. 14; Beschalte Weichthiere, p. 91.—ANCEY, Journ. de Conch., 1902, p. 277, fig. 5.

"The granose surface of this species is the result of the coarse raised lines of growth being crossed by transverse impressed striæ, which being somewhat remote from one another cause the granules to assume a rather elongate form. Mr. Alfred E. Craven informs me that the distinguished name of Dr. Kirk has already last year been associated with a species of this genus. Such being the case, I am compelled to alter the designation originally applied to this species; and therefore I have much pleasure in substituting that of *A. craveni*" (*Smith*).

The specimens from Nyasaland "are rather more coarsely sculptured than the type, and some have the stripes more zigzag than as represented in the cited figure. On the contrary, other specimens are uniformly greenish-yellow, without any striping at all" (pl. 7, figs. 16, 17).

60. A. FULMINATRIX Martens. Pl. 15, figs. 5, 6.

Similar to *A. craveni,* but decidedly more slender, the stripes also narrow, numerous and rather vertical on the upper whorls but on the lower most of them take a very oblique direction from above and right (of the observer) downwards and to the left. Cuticle pale yellow, readily deciduous. Length 59, diam. 28.5, length of mouth 31 mm.

Tanganyika, with *A. craveni* (Boehm and Reichard); near Jipe lake (Dr. Volkens); Kauli, Ussagara (Ancey).

A. fulminatrix MART., Sitzungsber. Ges. nat. Freunde zu Berlin, 1895, p. 146; Beschalte Weichthiere D. Ostafr., 1897, p. 91, pl. 5, f. 32, 38.—ANCEY, Journ. de Conch., 1902, p. 276, fig. 3.

As eggs were found in one of the specimens they may be assumed to be nearly full-grown. The eggs are 6 mm. long, nearly 5 wide, and of the usual pale yellow color of Achatina eggs. Description and figures are from von Martens.

61. A. ARCTESPIRATA Bourguignat. Pl. 14, fig. 2.

Shell obese-swollen, ventricose in the middle, rather opaque, somewhat glossy, uniform pale buff, lightly lightning-streaked with reddish-chestnut flammules; chalky-white under the cuticle. Spire acuminate-pyramidal, obtuse at the summit, the apex large, obtuse, somewhat mammillate. Whorls 8, a little convex, closely coiled, parted by a rather deep suture; the last whorl large, more than half the total alt., oblong-convex, tapering downwards. Aperture slightly oblique, elongate, rather narrow, very angular above, relatively narrow below. Columella short, straight, abruptly truncate. Peristome unexpanded, acute; callous thin, diaphanous. Length 57, diam. 32, aperture 31 x 16 mm. (*Bgt.*).

Around the southern end of Tanganyika (Bgt.).

A. arctespirata BGT., Moll. de l'Af. Equat., p. 83, pl. 5, f. 7 (1889).

Bourguignat writes as follows: ''In this species the flammules of the last whorl do not run zigzag to the base, but at the periphery suddenly assume a spirally forward descending direction. It is the only *Achatina* in which I have observed this pattern of flammules. *A. arctespirata* is remarkable for the spire, which though with a large, obtuse summit is pyramidal-acuminate, the whole having a short, squat appearance. The spiral increase is very slow, the last whorl notably tapering downwards, making it appear more swollen in the middle.

''This species is very abundant throughout the southern region of Tanganyika, but it is very rarely found in good condition on account of the fires set by the natives, which make the shell a uniform dull white by destruction of the epidermis.''

This species may prove to belong to the South African group *Cochlitoma*.

62. A. SPEKEI Dohrn.

Shell oblong, rather solid, very obsoletely granulate above, whitish under a corneous epidermis, irregularly streaked with fulvous. Spire conic, the apex rather obtuse, suture submarginate. Whorls 6 to 7, a little convex, the last three-sevenths the total length. Columella obliquely truncate, arcuate, covered with a thin callous. Aperture oblong-ovate (*Dohrn*).

Lake Victoria Nyanza (Speke).

A. spekei DOHRN, Proc. Zoöl. Soc. Lond., 1864, p. 117.—PFR., Monogr., vi, 220.

Differs from *A. ustulata* Lam., according to Dohrn, by the more slender spire, slimmer at the apex, the more convex early whorls and more arcuate columella. No dimensions have been given. It must resemble Pfeiffer's var. *b* of *A. allisa*.

63. A. STUHLMANNI Martens. Pl. 34, fig. 13.

Long-fusiform, thin, with unequal wrinkle-striæ and on the upper whorls with spiral striæ, which entirely disappear on the last whorl. Greenish-brown, with a few blackish streaks. Suture oblique, crenate, without margining line.

Whorls 8, scarcely at all convex, the last strongly descending to the aperture. Aperture nearly vertical, rounded-quadrate, somewhat less than half the shell's length, pale bluish within. Columellar margin rather vertical, weakly thickened, blue-white, broadly truncate below. Length 118, diam. 52, aperture 58 x 32 mm. (*Mart.*).

West of the upper Ituri river at Kibilibissi, in forest (Stuhlmann).

A. stuhlmanni MARTS., Sitzungsber. d. Ges. naturf. Freunde, 1892, p. 176; Beschalte Weichthiere D. Ostafr., p. 92, pl. 4, f. 9.

64. A. RANDABELI Bourguignat. Pl. 13, fig. 42.

Shell oblong, moderately swollen, exactly glandiniform, rather thin, subpellucid, rather glossy, sharply decussate (the upper whorls and lower half of the last smooth); somewhat olivaceous-chestnut, irregularly scattered with reddish flammules, lightly fulgurate and interrupted. Spire obtuse acuminate, at the summit obtuse, the apex rounded. Whorls 8, a little convex, rather slowly increasing, separated by an impressed suture; the last whorl oblong, rather swollen, more than half the total length. Aperture long-oblong, acutely angular above. Peristome unexpanded, acute. Columella straight, abruptly truncate. Callous inconspicuous. Length 55, diam. 28, aperture 31 x 15 mm. (*Bgt.*).

Neighborhood of Tabora, Unyanyembé.

A. randebeli BGT., Moll. de l'Afrique Equatoriale, p. 84, pl. 5, f. 6 (1889).—MARTENS, Beschalte Weichthiere, p. 92.

65. A. THOMSONI E. A. Smith. Pl. 11, fig. 34.

"Shell moderately solid, elongate ovate, beneath a yellow epidermis whitish, striped with blackish-brown. Spire sometimes purplish-red or whitish, more or less worn, and in consequence, to a certain extent, lacking the striping; the latter is, as a rule, rather regular and only a little wavy. Whorls 7, a little convex, striated by the lines of growth, covered by a thin yellow epidermis, which is beautifully sculptured with most minute striæ in a crisscross fashion, producing the woven appearance of a fabric; last whorl elongate, narrow, gradually descending. Aperture pyriform, bluish-white. Columella arcuate, thickened, not very abruptly truncated at the base, united to the lip by a thin callosity. Length 75 millims., diam. 32; aperture 38 long, 21 wide" (*Smith*).

Between Lake Nyassa and the east coast (Thomson); Lukwangulo Mt., 2,500 meters elev., central Uluguru (Nguru) (Dr. Stuhlmann).

A. thomsoni SM., Ann. and Mag. N. H., 1880, vi, p. 428; P. Z. S., 1881, p. 283, pl. 33, f. 12.—MARTENS, Beschalte Weichthiere D. Ostafr., p. 92.

"This species is remarkable for its narrow ovate form and the peculiar woven appearance of its epidermis. The proportion of the length of the aperture to that of the entire shell varies; in some specimens it occupies rather more than half the total length, and in others somewhat less. The deep-brown stripes edged with brown, as a rule, occupy more of the surface than the yellow spaces between, and although somewhat wavy (upon the last whorl especially), do not take a large zigzag pattern. Most specimens are more or less streaked with opaque golden lines in the direction of the lines of increment, which when falling upon the dark stripes tell very vividly" (*Smith*).

66. A. PASSARGEI v. Martens.

Shell conoid-oblong, solid, regularly closely striatulate and granulate; white, painted with pale brown, vertical, narrow streaks. Spire conic, the apex acuminate, slender. Whorls 7½, rather convex, regularly increasing, the suture moderately impressed and somewhat crenulate; the last whorl convex below. Aperture subvertical, small, piriform-ovate, the columellar margin vertical, rather thin, white, abruptly truncate; external margin lightly arcuate, basal margin narrowly rounded. Length 61.5, diam. 30.5, aperture 29 x 17 mm. (*Mts.*).

East Africa: Sodanna, in the northeastern angle of German East Africa (Dr. Passarge, 1898).

A. passargei MARTENS, Sitzungsber. Ges. naturforsch. Freunde zu Berlin, 1900, p. 119.

Group of A. pfeifferi (see p. 24).

67. A. ELLIOTI E. A. Smith. Pl. 14, fig. 3.

Shell elongate, narrow, whitish, covered with a glossy deciduous epidermis, buff streaked and maculate with black; striated with delicate growth-lines, delicately fold-like below the suture. Whorls 9, slightly convex, slowly increasing. Spire lengthened, obtuse at the apex. Aperture piriform, blue-whitish, hardly one-third the length of the shell. Columella arcuate, truncate below; lip very thin, curved. Length 38, diam. 13.5, aperture 12 x 7 mm. (*Smith*).

At the Albert Edward Nyanza, 3,000-4,000 ft. (G. Scott Elliot).

Achatina ellioti SM., Proc. Malac. Soc. London, i, p. 325, fig. 3 on p. 323 (Oct., 1895).

"This species is very distinct from all known species of *Achatina*. The narrow, elongate form and the remarkable shining epidermis, blotched and streaked with black and buff, are the most important features."

The columellar truncation is not sufficiently indicated in my copy of Mr. Smith's figure. In the general shape the shell approaches *A. pfeifferi.*

Spurious and Undetermined Species of Achatina, etc.

Oncaea crenata. Ventricose-ovate, 4 whorls flamed brown and dark; aperture white, 4 inches long. In Guinea (*Gistel,* Handbuch der Naturgeschichte aller drei Reiche, 1850, p. 550).

Oncaea marginata. Yellowish-white with brown streaks around 4 upper whorls, reddish columella and inner lip, and several gray, transverse striæ. Seven whorls, 1½ inches long. Habitat unknown (*Gistel,* l. c.).

This is evidently not *A. marginata* Swains., and it may be a form of *Liguus fasciatus.*

Achatina serpentina Beck, Index Moll., p. 76. Nude name.

Achatina crotallaria Schumacher, Essai d'un Nouv. Syst. Vers Test., p. 202 (1817) = *Stylifer* sp.

Subgenus LEPTOCALA Ancey, 1888.

Petitia JOUSSEAUME, Bull. Société Zoologique de France ix, 1884, p. 172, for *P. petitia* and *P. raffrayi*.—D'Ailly, Bihang etc., 1897, p. 71, not *Petitia* Chitty.—*Leptocala* ANCEY, Bull. Soc. Malac. de France, v, p. 70, footnote no. 3 (1888), type *A. mollicella* Morel.; Nautilus xii, p. 92 (1898). Not *Leptocola* Gerstaecker 1883 (*Insecta*).

The shell is ovate-oblong, very thin, more or less flammulate, glossy, and only minutely striate. The protoconch is smooth and rather large. The columella is truncate at the base as in *Achatina*. The eggs (of *A. pulchella* Mts.) are dirty white, and measure 4 x 5 mm. The radula of *A. pulchella* has, according to Schako, a very small central tooth, laterals with an ectocone; marginals with the entocone developed, so that they become tricuspid.

This group differs from *Achatina* chiefly in the thin texture and minute sculpture of the shell and in the color of the eggs. It is admitted as a genus by d'Ailly, but no adequate generic characters have yet been formulated for it. Only two or three species have been satisfactorily shown to exist, although the roll of names proposed contains three times that number.

Species of Leptocala.

1. Shell densely, very finely striate spirally; decorated with narrow undulating flames extending upon the base. West African (*Leptocala s. str.*).
    a. Length 18, diam. 12 mm.; whorls 6; stripes wider on the spire. Guinea. *A. mollicella,* no. 1.
    b. Length 32, diam. 15 mm.; whorls 6-7; stripes not noticeably wider on the spire. Congo and Kamerun. *A. m. petitia,* no. 1*a*.
2. Shell with faint, inconspicuous growth-striæ; whitish-corneous with indistinct reddish streaks on the base; length 27, diam. 12 mm. Angola. *A. specularis,* no. 2.
3. Shell without spirals; flames abruptly terminating in

spots at the periphery, the base darkened. East African. (Section *Leptocallista Pils.*).

a. 26 x 12 mm. with 7 whorls; Abyssinia. *A. raffrayi,* no. 3.

b. 36 x 15.5 mm., with 9 whorls; Nguru Mts. and Ussambara. *A. grandidieriana,* no 4.

1. A. MOLLICELLA Morelet.

See *antea* p. 29, where the description of this species is translated. Ancey states (Nautilus xii, p. 92, Dec. 1898) that on comparison with *A. pulchella* Martens he finds the two to be identical specifically. Since the forms described by Jousseaume and von Martens may prove to be distinguishable from *mollicella,* and have been figured, I give the descriptions below.

1a. Var. *petitia* (Jousseaume). Pl. 34, fig. 15.

"Shell ovate-oblong, very thin, submembranous glossy, very delicately striate spirally, buff-corneous ornamented with wavy longitudinal yellow lines. Whorls 7, a little convex, the last slightly wider, one-third the total length, columella somewhat straightened, compressed, obliquely truncate basally. Aperture oblique, oblong-ovate, the peristome simple.

"Length 32, diam. 15, length of aperture 13.5, width 8 mm." (*Jouss.*).

On the Congo above the N'toc river (L. Petit.). Kamerun at Bibundi (Jungner), Bonjongo, Victoria (Buchholz), Buea (Preuss.).

Achatina pulchella v. MARTENS, Monatsbericht der Preuss. Akad. der Wissensch. zu Berlin, 1876, p. 258, pl. 3, f. 1, 2.—SCHACKO, in Möbius' Reise nach Mauritius, p. 341 (dentition). Not *A. pulchella* Spix, 1827, nor of Pfr., 1856.—*Petitia pulchella* v. Mart., d'AILLY, Bihang, K. Sv. Vet.-Akad. xxii, p. 71.—*Petitia petitia* JOUSSEAUME, Bull. Soc. Zool. de France pour l'année 1884, p. 172, pl. 4, f. 4.—*Achatina smithi* SOWERBY, Proc. Zool. Soc. Lond. 1889, p. 579, pl. 56, f. 3. Not *A. smithii* Craven, 1880.—*A. sowerbyi* SMITH, Ann. and Mag. N. H. (6 ser.), vi, 1890, p. 392.

Jousseaume's description and figure (pl. 34, fig. 15) are given. The latter differs from von Martens' illustration of *pulchella* in the less obtuse summit, narrower columella and in having a half-whorl more; but the two agree exactly in measurements. The discrepancy may be due to inaccurate drawing by Jousseaume's artist. It is therefore doubtful whether the Cameroon form is separable even as a variety; d'Ailly uniting them. The original figure of *A. pulchella* is copied in pl. 34, fig. 14. The original description follows:

"Shell oblong-ovate, very minutely spirally lineate, otherwise smooth, glossy; whitish, painted with close narrow wavy stripes of orange. Spire conoid, the apex obtuse. Whorls 6 to 6½, a little convex, suture rather deep and simple. Aperture somewhat oblique, occupying two-fifths to three-fourths the length, sinuate-oval, acute above; peristome thin, unexpanded; columella arcuate, orange tinted, obliquely truncate. Length 32, diam. 15, aperture 8 mm. wide, 13.5 long. Bonjongo, in the Kamerun mountains." (*v. Mart.*).

The names *pulchella* Martens, *smithi* Sowerby and *sowerbyi* Smith pertain to the Cameroon form, which if it proves distinguishable from that of the Congo, will be called var. *sowerbyi* Smith. All of these are larger than Morelet's *A. mollicella.*

2. A. SPECULARIS Morelet. Pl. 2, figs. 15, 16.

Shell ovate-elongate, very thin, nearly smooth, diaphanous, whitish corneous, the base obscurely marked with reddish streaks. Spire long-conic, the apex obtuse, suture impressed, nearly simple. Whorls 8, slightly convex, the last a little swollen, more than two-fifths the total length. Columella lightly arcuate, abruptly truncate at the base. Aperture semioval, the peristome thin, unexpanded. Length 27, diam. 12 mm. (*Morel.*).

West Africa: banks of the Rio Moembege, district of Cazengo, Angola (Welwitsch).

Achatina specularis MOREL., J. de C. 1866, p. 159; Voy. Welwitsch p. 74, pl. 4, f. 4.—PFR. Monogr. vi, p. 219.

A fragile, transparent shell, sometimes unicolored, sometimes ornamented with indistinct wavy reddish-fawn striæ. The growth-striæ are irregular and inconspicuous to the naked eye. Adolf d'Ailly has suggested that the species be referred to this group.

Section *Leptocallista* Pilsbry, 1904.

3. A. RAFFRAYI (Jousseaume).

"Shell oblong, very thin, submembranous, glossy, very delicately striatulate at the suture; buff-corneous, painted with longitudinal straight or wavy rufous flames, interrupted at the periphery, base broadly banded with roseate. Whorls 7, a little convex, the last slightly wider, a little more than one-third the total length. Columella somewhat straightened, compressed, obliquely truncate at the base. Aperture oblique, truncate-oval, the peristome simple."

Length 26, diam. 12, aperture length 10, width 6 mm.

N. E. Africa: Abyssinia (Raffray).

Achatina raffrayi JOUSS., Le Naturaliste v, August 1883, p. 324.—*Petitia raffrayi* JOUSS., Bull. Soc. Zool. Fr. ix, 1884, p. 172.

On the intermediate whorls the flames widen towards the lower suture; on the last whorl they are more irregular, and widen or coalesce to form large brown spots on the convexity of the whorl, in which the flames abruptly terminate along a line which is an exact continuation of the suture. The base, up to the yellowish belt below the spots, is nearly uniform vinous red.

This species has not been figured. The above description and notes are from Jousseaume, and show the shell to be very close to *L. grandidieriana* Bgt. There seems to be little aside from size and locality, to separate the two forms; the smaller size coupled with the less number of whorls probably indicating that *raffrayi* was based on a younger shell than *grandidieriana*.

4. A. GRANDIDIERIANA (Bourguignat). Pl. 42, figs, 6, 7; pl. 40, figs, 1, 1.

Shell lengthened oblong, solid but still subtranslucent, very glossy, smooth, polished, seen to be delicately striate under a very strong lens; opaline, the lower part of the last whorl is vinous-chestnut, and the whorls (except the first) are elegantly ornamented with narrow black-chestnut lines terminating in wide spots of the same color at the periphery. Spire tapering, the summit obtuse. Whorls 9, a little convex, regularly and slowly increasing, separated by an impressed suture; the last whorl convex, slightly over one-third the alt. Aperture oblique, relatively small, irregularly ovate, violaceous and showing the spots inside, whitish at the edge; peristome unexpanded, acute. Columellar margin short, curved, at the base contorted and abruptly, strongly truncate. Parietal callous vinous. (*Bgt.*).

Length 36, diam. 15.5, alt. aperture 13, width 7 mm. (*Bgt.*).

East Africa: Nguru Mts., 1800-2000 meters elevation (Alex. Leroy); Ussambara (Conradt, W. Schmidt).

Stenogyra grandidieriana Bgt., Moll. de l'Afrique Equat., 1889, p. 111, pl. 6, f. 9, 10.—*Achatina g.*, v. Martens, Beschalte Weichthiere D. Ost-Afr. p. 93.—*Achatina nitida* v. Mart., Conch. Mittheilungen iii, p. 7, pl. 43, f. 1, 2. (1896).

The color-pattern is characteristic, no less than the total want of granulation and the glossy surface. Figs. 6, 7 of pl. 42 are copied from Bourguignat's figures of his type. Figs 1, 1 of pl. 40 represent the synonymous *A. nitida*.

Perhaps this is to be regarded as a variety of *A. raffrayi*, with which it agrees in coloration. It is larger, more solid and has two more whorls.

Genus COCHLITOMA Fér., Pilsbry, 1904.

Cochlitoma Fér., (in part) Prodr. p. 48.—*Achatina* of authors.

Ovate or oblong shells, with *the apex obtuse and of the bulbous or globose type,* the initial whorl smooth, the rest of the protoconch decussate-granose, this sculpture extending without interruption upon the adolescent and usually the adult stages; aperture as in *Achatina,* the columella distinctly truncate at its base.

Soft anatomy so far as known similar to *Achatina.* Reproduction *ovo-viviparous,* the young shells at birth decidedly larger than the eggs of Achatinæ of corresponding adult size.

Type *Bulimus zebra* Brug. Distribution, South Africa.

The distribution of *Cochlitoma* is roughly limited on the north by the Tropic of Capricorn. A few species of *Achatina,* such as *A. panthera* and *A. immaculata* occur south of this limit.

Almost all of the South African Achatinæ belong to *Cochlitoma,* and agree in having the *apex rather large and rounded,* the first whorl nearly flat, smooth except for slight ripples, *several following whorls decussate-granulose.* This sculpture may extend to and upon the last whorl. They are ovo-viviparous, producing numerous young at a time. In typical *Achatina* the apex is more *trochiform.* By acceleration, the decussate sculpture, so characteristic of the stage of maturity in *Achatinidæ*, has invaded the embryonic stage, so that the first whorl only of the unborn young is smooth, while *Achatina* proper is a much less evolved generic type, in which several whorls of the protoconch are smooth.

In the uterus of a specimen of *A. zebra,* Semper found about 60 undeveloped eggs with thick, calcareous shells, the smallest 3 mm., the largest 6 mm. long; then 25 embryos which had crawled out of the egg-shell; on the foot the embryos carried a large podocyst, which in the youngest individuals enveloped the whole shell of 1½ whorls. See also under *A. crawfordi,* species no. 18. It is likely that some species will be found to be oviparous.

Metachatina kraussi (Vol. XVI, p. 307) is so closely related to the present group that it is doubtful whether it should be separated generically on account of the single character of an obsolete columellar truncation. The form and sculpture of the protoconch and the method of reproduction are identical in *Metachatina* and *Cochlitoma.*

Cochlitoma was proposed by Férussac to comprise snails with the shell ovate or oblong-ovate and having the columella truncate below,—a group practically equivalent to *Achatina* of Lamarck's Animaux sans Vertèbres, and of most subsequent authors during more than half of the last century.

Before Férussac, generic names had already been proposed for part of the species of his list, *Achatina* Lam. 1799 comprising species 345 to 349, 352 and 353; *Liguus* Montf. 1810 takes in species 343, 344. Subsequent eliminations removed 342 to *Corona* (1850), 341 to *Pseudotrochus* (1855), 339 to *Atopocochlis* (1888), and 350, 351, to *Archachatina* (1850). These removals have left only no. 354, *Helix zebra* Fér., *Achatina zebra* of authors, the sole unassigned species of Férussac's list; and I propose to restrict the name *Cochlitoma* to species of this type. I cannot find that a type for the group has been selected by any author up to this time.

Cristofori et Jan in the catalogue of their collection, 1832 (Sect. ii, part 1, p. 4), place only *A. perdix* Lam. under *Cochlitoma.* This might be held to restrict the name to that species, were it not that the locality given, "Amer Antill." throws grave doubt upon the identification and the name *perdix* does not occur in Férussac's list.

Literature of South African Achatinidæ. The special literature began with Dr. F. Krauss (b. 1812, d. 1890) author of that excellent work Die Südafrikanischen Mollusken, Stuttgart, 1848. Krauss gave a list of the Achatinas with valuable notes on pp. 80, 81. In the Annals and Magazine of Natural History (6), vi, pp. 390-393, Mr. Edgar A. Smith catalogued the species known up to 1890. In the same year Messrs. James Cosmo Melvill and John Ponsonby began a series of papers of the first importance upon the South African fauna, continuing to the present time, containing descriptions and figures of a large number of species of *Achatina.* They have also published a summary of the land molluscan fauna of the region in Proceedings of the Malacological Society of London, iii, *Achatinidæ* on pp. 178, 179 (1898). Finally Dr. Rudolf Sturany also has enumerated the species in his Catalog der bisher bekannt geworden Südafrikanischen Land- und Süsswasser-Mollusken, in Denkschrift der Math. naturwissenschaftlichen Classe der Kaiserlichen Akademie der Wissenschaften, vol. lxvii (1898).

Groups of South African Cochlitomæ.

I. *Group of C. semidecussata.* Chiefly rather slender shells, the spire conspicuously granose-decussate, last whorl costulate or granose. Species 1 to 5.

II. *Group of C. zebra.* Ovate or oblong, rather strong, closely zebra-striped with dark or blackish chestnut, the stripes sometimes confluent below; last whorl generally smoothish. Species 6 to 16.

III. *Group of C. varicosa.* Ovate or obesely ovate, *thin,* light shells, usually flammulate. Species 17 to 21.

IV. *Group of C. dimidiata.* Ovate, the spire decussate, last whorl generally *smooth* and glossy; *nearly uniform olivaceous, brownish or yellowish,* without flames, but usually with a few streaks along growth-lines. Species 22 to 31.

V. *Species of uncertain position,* some of them perhaps be- Species 32 to 34.

I. *Group of C. semidecussata.*

Rather slender shells (except *C. granulata*), with the apex large and rounded, the spire conspicuously decussate-granulose, the last whorl costulate-striate or granose. Aperture and columella whitish.

1. C. GRANULATA (Krauss). Pl. 29, fig. 44.

Shell fusiform-ovate, solid, brownish or olivaceous *yellow, closely marked with reddish-chestnut stripes,* part of them more or less zigzag. Closely, finely and strongly striate, decussated by more spaced and superficial spirals over the whole surface. The vertical striæ are deeper and more regular on the spire, recurved and puckered below the suture. Spire regularly tapering, rather slender above, the apex obtuse and rounded. Whorls 8½, moderately convex, the last oblong. Aperture about half the total length, lilac-white or blue-white within. Columella white, strongly arcuate, compressed, its callous narrow and thick, narrowly truncate or sinuous at base. Parietal callous white, thin and transparent towards the outer lip.

Length 145, diam. 70, aperture 80 mm.
Length 130, diam. 64, aperture 68 mm.
Length 105, diam. 49, aperture 55 x 28 mm. (*Pfr.*).

S. Africa: Woods in Outeniqualand, George District (Krauss); Natal (Dr. Wahlberg). Pondoland (Conrad Beyrich). Howick; frequent in the Maritzburg district (E. W. Swanton).

Achatina zebra var. *granulata* KRAUSS, Die Südafrikanischen Mollusken, p. 80 (1848).—*A. granulata* PFR., P. Z. S. 1852, p. 66; Monogr. iii. p. 484.—SEMPER, Reisen im Archip. Phil., Landmoll., p. 143, pl. 12, f. 2 (genitalia); pl. 16, f. 14 (teeth.—MARTENS, Archiv f. Naturg. 1897, p. 36; Sitzungsber. Ges. nat. Fr. 1890, p. 87.—SWANTON, Journ. of Conchology x, p. 195 (July, 1902).—*A. semigranosa* PFR., P. Z. S. 1861, p. 25; Mal. Bl. 1861, p. 78; Monogr. vi, p. 216 (young of *granulata; cf.* Smith, Ann. Mag. (6), vi, p. 391).

Readily known by its conspicuously granulate spire, a little attenuated near the obtuse apex, the concave, narrow and peculiarly compressed columella, etc. Different as are the adult shells, the young show relationship with *C. semidecussata.*

2. C. SEMIDECUSSATA ('Mke.' Pfr.). Pl. 30, fig. 51, 52, 53.

Shell ovate-turrite, rather thin, white under a greenish-yellow cuticle, irregularly marked with well-spaced chestnut stripes, which are often interrupted or zigzag. Sculpture of fine, close, more or less waved rib-striæ, cut into granules by decussating spirals, this sculpture much weaker below the periphery, and usually coarser below the suture. Whorls about 8, convex. Spire regularly tapering to the large, obtuse, rounded apex. Aperture narrow above and below, pearly bluish and showing the dark streaks within; outer lip thin; columella whitish, gently concave above, straight below, and abruptly truncate. Parietal callous transparent, very thin.

Length 75, diam. 32, aperture 38 mm.
Length 70, diam. 29, aperture 33 mm. (*Pfr.*).

S. Africa: Natal (Mke.), Upper Olifants river, north of Middelburg, Transvaal.

A. semidecussata Mke. MSS., PFR., Symbolae iii, p. 91

(1846); in Phil., Abbild. ii, p. 213, pl. 1, f. 1; Monogr. ii, 257; Conchyl. Cab. p. 336, pl. 27, f. 2, 3.—KRAUSS, Die Südaf. Moll. p. 81. — V. MARTENS Sitzungsber. Ges. naturforsch. Freunde zu Berlin, 1899, p. 164.—STURANY, Catalog, p. 57.— SMITH, Ann. and Mag. 1890, p. 391.

Distinct by its narrow, lengthened shape and beautifully clear-cut granulation. The large apex and irregular markings are also characteristic.

3. C. PENTHERI (Sturany). Pl. 30, fig. 50.

The shell is lengthened, turrite, and consists of 7½ whorls. The apex (embryonal whorl) is not pointed, but rounded, and is formed of 1½ smooth whorls; regularly spirally striate whorls follow. In regular spiral series are arranged granules, which increase in size with the enlargement of the whorl, but on the last whorl cease at about the middle. The marking consists of brown streaks or lengthened spots in a longitudinal direction, on the last 3 or 4 whorls. These streaks are broader near the suture below, running to a point above. Length 40, diam. 19, aperture 19 x 10.5 mm. (*Sturany*).

S. Africa: Durban (Dr. Penther, 1897).

A. pentheri STURANY, Catalog Südaf., Denkschr. Math.-naturwissensch. Cl. K. Akad. Wissensch., lxvii, p. 592, pl. 2. f. 40 (1898).

Very closely related to *C. semidecussata,* from which it is separable chiefly by the smaller size.

4. C. VESTITA (Pfeiffer). Pl. 30, figs. 46, 47, 48, 49.

Shell subfusiform-turrite, thin; longitudinally *closely plicate-striate;* white, covered with a tawny, *scaly cuticle.* Spire turrite, nude above, obtuse, the suture shallow, densely crenulated, whorls 8, rather flattened, the last a little shorter than the spire, somewhat tapering basally. Columella arcuate, somewhat twisted, transversely truncate. Aperture little oblique, acuminate-oval, whitish within; peristome simple, the right margin lightly arcuate. Length 75, diam. 31, aperture 38 x 17 mm. (*Pfr.*).

S. Africa: Port Natal (Plant). Pondoland (Conrad Beyrich).

A. vestita PFR., P. Z. Soc. 1854, p. 293; Novit. Conch. p. 35, pl. 9, f. 8, 9; Monogr. iv, 603; Malak. Bl. ii. p. 168.—SMITH, Ann. and Mag. N. H. 1890, vi, p. 391.—STURANY, Catalog, p. 58 [594].—MARTENS, Archiv f. Naturg. lxiii, 1897, p. 36; Sitzungsber. Ges. nat. Freunde, 1890, p. 87 (notes on sculpture); Conch. Mittheil. iii, p. 2 (1894).

In the general shape and character of markings, as well as in the sculpture of the spire, *C. vestita* has much in common with *C. semidecussata.* The first whorl is nearly smooth; several following whorls are decussate-granulate; but the last two whorls are finely and sharply costulate-striate, the costulæ bearing recurved cuticular scale-like processes (fig. 49). The columella is compressed and sinuous, with a sort of "siphonal funicle" near the base. A somewhat similar structure may be seen in *C. granulata.* Length 68, diam. 31, aperture 35 mm.

5. C. DELORIOLI (Bonnet). Pl. 28, fig. 41.

Shell thin, transparent, obtuse, marked with oblique striæ, very strong on the last whorl, finer towards the summit of the spire where they are decussated by spirals, which are also inconspicuous. Last two or three whorls are covered with a deep fulvous cuticle, paler towards the apex as well as towards the umbilical region. Spire composed of 7 convex whorls, the suture noticeably sinuous, the last whorl semiglobose, marked with large and long irregular streaks of a dark brown color, and not reaching to the ends of the whorl. Sometimes these streaks are quite oblique and disappear towards the summit of the spire. Aperture oval, the peristome very thin, violaceous white inside, but yellowish by transparence, showing the external spots. Columella whitish. Length 72, diam. 32 mm. Habitat, Brazil (Bonnet).

Achatina de Lorioli BONNET, Revue et Magazin de Zoologie (2 sér) xvi, 1864, p. 279, pl. 22, figs. 1, 1 a. ("*Achatina lorioli*" at foot of plate).—*A. lorioli* PFR., Monogr. vi, p. 218.

Seems to be *exactly similar to C. vestita* except in the *small apex* shown in Bonnet's figure. This may perhaps be an error on the part of the draughtsman. Figure and description from Bonnet.

II. *Group of C. zebra.*

Ovate or oblong shells, very closely zebra-striped with dark chestnut throughout, the stripes sometimes confluent below. Apex rather large and obtuse. Last whorl generally almost smooth.

6. C. INDOTATA (Reeve). Pl. 6, fig. 10.

Shell oblong-ovate, thin, ventricose, decussate-striate above. Buff-white, lightning streaked with broad chestnut stripes. Spire conic, the apex obtuse. Suture subcrenulate-marginate. Whorls 7 to 8, a little convex, the last about as long as the spire, nearly smooth. Columella arcuate, callous, abruptly truncate at the base. Aperture slightly oblique, acuminate-oval, whitish inside; peristome simple. Length 136, diam. 62, aperture 73 x 36 mm. (*Pfr.*).

West Africa (Cuming coll.). South Africa: Elim, near Cape Agulhas (Albers coll.).

A. indotata RVE., Conch. Icon. v, pl. 6, f. 18 (1849).—PFR., Monogr. iii, p. 483.—v. MARTENS Conchol. Mittheil. ii, p. 139.

7. C. ZEBROIDES (E. A. Smith).

"Shell rather solid and heavy for its size, ovate, white, varied with numerous close-set and slightly oblique reddish-brown stripes, which are rather regular and only slightly undulating; spire obtusely conical, white towards the apex which is rather rounded and not acute, suture but slightly oblique, crenulated; whorls 7, quite convex, the third and fourth from the nucleus ornamented with a close granulation, the granules being elongate; on the two succeeding whorls they are less conspicuous, and on the last become almost obsolete; aperture small, not equalling half the entire length of the shell, within coated with a white opaque enamel and streaked here and there rather indistinctly by the exterior brownish stripes; columella coated with a thin white callosity, which extends as far as the upper extremity of the outer lip; it is a little arcuated and rather abruptly but obliquely truncated at the basal end; peristome simple, regularly curved, and thin." (*Smith*).

Length 46, diam. 23, aperture 23 x 12.5 mm.

Habitat unknown.

A. zebroides SMITH, Quart. Journ. of Conch. i, p. 347 (May, 1878).

"This species, of which I have seen only a single specimen, agrees in form very fairly with *A. porphyrostoma* Shuttleworth, with the exception of the spire being a little less obtuse; and in coloration it reminds one very much of *A. zebra.*" (Smith).

8. C. MACHACHENSIS (E. A. Smith). Pl. 41, fig. 7.

Shell long-ovate, moderately thin, white under a thin, glossy yellow cuticle, painted with longitudinal arcuate reddish-black streaks, sometimes more or less undulating or bifurcating. Spire produced, lightly convex, obtuse at the apex. Whorls 7, a little convex striated with delicate oblique growth-lines, separated by a linear, thickened white suture; the last whorl noticeably descending in front. Aperture inversely ear-shaped, scarcely half the total length, bluish within and somewhat pearly, showing the blackish streaks through. Columella a little arcuate, whitish in front, obliquely shortly truncate, joined to the lip above by a thin bluish callous (*Smith*).

Length 58, diam. 31, aperture 28 x 16 mm.

Length 52, diam. 27, aperture 25 x 15 mm.

S. Africa: Basutoland on Mount Machacha, at about 10,000 ft. elevation (R. Crawshay).

A. machachensis SMITH, Proc. Malac. Soc. London, v, p. 169, fig. in text. (July, 1902).

This is the first species recorded from Basutoland, and although exhibiting in some respects a relationship to the well-known *A. zebra,* it seems on account of its elongate-ovate form to be worthy of specific separation. *A. rhabdota* of Melvill & Ponsonby is very similar as regards general form and the style of markings, but is described as decussately granulated, a feature entirely absent in the present species, which moreover appears to have more convex whorls, presuming that the figure of *rhabdota* is accurate, for their form is not described in the author's diagnosis. Besides in the characters already referred to, this species also differs from *A. rhabdota* in the form of the aperture. *A. crawfordi* Morelet, from Port Elizabeth, is also very similar in general outline, but is somewhat thinner, finely granulated, and with lighter-colored markings (*Smith*).

9. C. FULGURATA (Pfeiffer). Pl. 27, fig. 34.

Shell conic-ovate, thin; granulated by longitudinal striæ, close above, obsolete on the last whorl, and spiral lines. Corneous-buff, ornamented with wide, blackish, zigzag streaks. Spire conic, obtuse; whorls 6½, the upper ones a little convex, the last swollen, granulated by a few spiral lines below the suture, nearly smooth below the middle. Columella blue, scarcely arcuate, abruptly truncated above the base of the elliptical-semioval aperture. Peristome simple, unexpanded. Length 67, diam. 36, apert. 42 mm. long, 21 wide in the middle (*Pfr.*).

West Africa.

Achatina fulgurata PFR., Proc. Zool. Soc. Lond. 1851, p. 258; Monographia iii, p. 486; Conchyl. Cab. p. 319, pl. 26, f. 1.

This species may belong near *A. studleyi.* Description and figure from Pfeiffer.

10. C. ZEBRA (Bruguiere). Pl. 28, fig. 39.

Shell ovate-conic, rather thin but strong; under a thin yellow cuticle it is white, *closely striped with dark brown,* the stripes narrow, usually about equal to their white intervals, vertical, and slightly dislocated in places. Surface of the last whorl smooth except just below the suture, where it is granose. Whorls of the spire densely granose-decussate. Whorls 8, slightly convex, the suture whitish and puckered. Aperture white within, contained about one and two-thirds times in the length of shell. Columella arcuate, white; the parietal wall white calloused around the axis, transparent above.

Length 5 inches, diam. 2 inches, 9 or 10 lines (Brug.).

South Africa: Districts George and Uitenhage, common under plants on the downs, especially large-leaved species of Mesembryanthemum, less common in the forests (Krauss).

Bulla achatina Born, Test. Mus. Cæs. Vind. pl. 10, f. 1 (good).—*Bulimus zebra* Brug., Encycl. Méth. i, p. 357, no. 100.—Perry, Conchology pl. 30, f. 3 (copied from Born!).—*Helix zebra* Fer., Hist. pl. 133.—*Achatina zebra* Lam., An. s. Vert. vi, p. 128.—Reeve, Conch. Syst. ii, pl. 179, f. 17; Conch. Icon. v, pl. 7, f. 23.—Pfr., Monogr. ii, 250; iii, 482; iv, 600; vi. 212; Conchyl. Cab. p. 291, pl. 2, f. 3; pl. 23, f. 1 (small form).—Desh., in Fér. Hist. ii, p. 156.—Krauss Die Südaf. Moll. p. 80, with var. *granulata* (1848).—Smith, Ann. and Mag. N. H. (6) vi, 1890, p. 392.—Sturany, Catalog, p. 58 [594].—*A. chemnitziana* Pfr., Symbolæ ii, p. 132, 1842, no descript., based upon Lam. *sup. cit.*—*Achatinus zebra* Montf. Conch. Syst. ii, p. 419 (?? pl. 418).—*Achatina zebra* Ch., de Roissy, Beck, Ind. Moll. p. 75, with var. *microstoma* = *Chemnitz,* C. Cab. ix, f. 1014.—Semper, Reisen, Landmoll., p. 144, pl. 12, f. 22 (uterine young).—*A. borniana* Beck, *l. c.* (1837).—*A. capensis* Albers, Die Hel., 1861, p. 203, note 4.—*A. tigrina* Cuming, Beck, Index, p. 75, based on Fér. Hist. pl. 133.—*Ampulla zebra* in part, and *A. quagga* in part, Bolten, Mus. Bolt. p. 111.

This handsome Cape species is frequently seen in a more or less artificial condition of polish, the effect of "cleaning" with acid. It is not known with certainty what form of the species Bruguiere had, but from his selection of Born's engraving as "good,"—the only one so distinguished—we may well take that to be typical *zebra.* That Bruguiere included *fulica* also in his conception of the species is shown by his citation of Seba's figures of that shell, and by the statement that he had found it living in Madagascar.

The typical *zebra* therefore will include shells with the spire rather long and slender of which Reeve's figure (copied on pl. 28, fig. 39) is an extreme example. *A. borniana* is identical. "In fresh shells the first four whorls are uniform yellowish-white, the fifth and sixth whitish and brown, the two last are always banded brownish-yellow and chestnut-brown. The first 6 whorls are more or less granulose, but the lower part of the penult. and the entire last whorl are always smooth and glossy. Length 4, diam. 2¼ inch.'' [about 100 x 56 mm.]. (*Krauss*).

Melvill and Ponsonby place *fulgurata, kraussi* and *obesa* as varieties under *A. zebra* (Proc. Malac. Soc. Lond. iii, p. 179).

Var. *obesa* Pfr. Pl. 27, fig. 35.

This name may be applied to the short, compact form of the species, such as the specimen figured, which however has the shortest spire of any adult shell in the series before me. The aperture is between .6 and .7 of the length. The sculpture does not differ from that of typical *zebra*.

S. Africa. Pfeiffer's locality "West Africa" is doubtless erroneous.

A. obesa Pfr., Malak. Bl. i, 1854, p. 224; Monogr. iv, 600; vi, 212; viii, 273.—*Helix zebra* var. ? an juv. ? Fér., Histoire, pl. 133, middle figure.

11. C. kraussi (Reeve). Pl. 16, figs. 10, 11; Pl. 27, fig. 36.

Shell ovate, slightly ventricose, rufous-chestnut, covered with a hard glossy cuticle; whorls, except the last, longitudinally streaked, the streaks white, sometimes straight, sometimes sinuous, distant, and extending to a variable length below the suture. Spire rather short, the apex obtuse. Aperture ovate, white. Length 2.75, diam. 1.5 inch. (*Rve.*).

S. Africa: right bank of the Koega river close to its mouth at Algoa Bay, under large-leaved bushes of Mesembryanthemum (Krauss).

Achatina kransii Reeve, P. Z. S. 1842. p. 55; Conch. Syst. ii, p. 88, pl. 179, f. 19.—*A. kraussi* Pfr., Symbolæ ii, p. 133; Monogr. ii, p. 250; iii, 483; iv, 601; vi, 212; Conchyl. Cab. p. 329, pl. 23, f. 2.—Krauss, Die Südaf. Moll. p. 81.—Reeve, Conch. Icon. v, pl. 6, f. 21 (1849).—Smith, Ann. and Mag. N. H. (6), vi, p. 393.—Martens, Sitzungsber. Ges. nat. Freunde zu Berlin, 1890, p. 86.

The shell is smaller than *C. zebra,* far smoother, the decussation or granulation being confined to the upper whorls and rather weak there. The slightly crenulate suture is white margined. A specimen from near Port Elizabeth measures, length 74, diam. 39, apert. 40 mm. It is not always so solid as would be gathered from Krauss' remarks. Fig. 11 of pl. 16 is a copy of the type figure; fig. 10 another specimen; and pl. 27, fig. 36 is copied from Reeve's figure of a large Cumingian specimen, which has also been figured by Pfeiffer in the Conchylien Cabinet.

Reeve, by some error or misunderstanding, printed the name "*kransii*" in his first description and illustration, but he makes it clear whom he intended to honor by the name, and subsequent authors including Reeve himself have accepted the rectification made by Dr. Pfeiffer.

"This species resembles *A. zebra* in shape, but differs in the much stronger shell, and the white and predominating dark brown coloration, which often is variable, as I have shells with the last whorl uniform dark brown. It has 7 whorls, all smooth, and crenulate at the suture only. It is generally 2.75 inches long, 1.5 wide [about 69 x 38 mm.], only one specimen among the great number I have collected is 3 inches long and has 8 whorls" (*Krauss*).

"Of four specimens brought from Cape Colony by Dr. Penther, the largest measured 122 mm. long and 51 mm. wide, aperture 63 x 33 mm." (*Sturany*).

12. C. ALBOPICTA (E. A. Smith). Pl. 13, fig. 43.

"Shell rather solid and heavy, ovate, acuminate above or in the direction of the apex. The colors are about equally divided, and consequently the ground color may be termed either white or dark-brown; in the former case it would be streaked and blotched with brown and in the latter with white. The streaking and blotching are very irregular, but decidedly display a tendency for an oblique direction parallel with the lines of growth. Whorls 7½ rather convex, and ornamented over the entire surface with narrow, elongate granules, which like the coloring also follow the direction of the incremental lines and striæ. The last whorl is not very ventricose, but extends or is produced some distance below the truncated end of the columella. The aperture is about as long as half the entire length of the shell, of an irregular, elongate, oval form, acute superiorly, very white within, being covered with a thick, shelly deposit of that hue. The columella is only slightly arched, also clothed with a white callosity extending upwards over the whorl as far as the extremity of the outer lip. The truncation is rather abrupt and narrow." (*Smith*).

Length 84, diam. 37, aperture 43 x 22 mm.

Habitat unknown.

A. albopicta SMITH, Quart. Journ of Conch. i, p. 346.—ANCEY, Journ. de Conchyl. 1902, p. 278, fig. 7.

"The nearest ally of this species appears to be *A. kraussi* Rve. It differs from it, however, in having a more elongate and acuminate spire, the more varied and irregular character of the blotching and the strongly marked granular sculpture" (*Smith*).

Ancey, who examined the type in B. M., states that the individual described is denuded of cuticle, so that the name given by Mr. Smith is not applicable to fresh specimens, in which the ground-color is not white but quite a dull yellow. The species is readily recognizable by the convexity of its whorls especially near the suture. Fig. 43, after Ancey, represents the typical form, in addition to which he possesses a second one, constituting a "var. *subunicolor,* in which the shell is almost wholly yellow, with some few figures or maculations especially on the upper whorls."

13. C. USTULATA (Lamarck). Pl. 28, fig. 38; pl. 29, fig. 45.

Shell oblong, narrow, thin; yellow, nearly covered with broad, zigzag or interrupted black-chestnut markings, narrower below the suture, where short stripes are interposed; the upper whorls dull flesh colored. Surface of the spire very finely decussate-granulate, the last whorl glossy and smooth except for puckering below the suture. Spire long, regularly tapering to an obtuse summit; suture margined. Whorls about 7½, slightly convex. Aperture small, ovate, white and lead-bluish within; lip thin, the columella quite concave above, truncate, with a thin and narrow, reflexed brownish callous. Parietal callous thin, transparent.

"Length 2 inches 10 lines" (Lam.).

Length 83.5, diam. 33, aperture 37 mm.

S. Africa: George district, Cape Colony (Krauss); Pondoland (Beyrich).

Achatina ustulata LAM., An. s. Vert. vi, pt. 2, p. 130 (1822). —REEVE, Conch. Syst. ii, pl. 177, f. 5; Conch. Icon. v, pl. 12, f. 40.—DESH. in Fér., Hist. p. 164, pl. 125, f. 1, 2.—PFR., Monogr. ii, 257.—KRAUSS, Die Südafric. Moll. p. 81.—MARTENS, Sitzungsber. Ges. nat. Freunde 1890, p. 88.

A much elongated member of the *C. kraussi* group. It is rare according to Krauss, in the old forests. Reeve has figured a shell very much narrower than the typical form, see pl. 29, fig. 45. A more strongly granulose form than usual has been reported by von Martens from Pondoland.

14. C. ZEBRULA (v. Martens).

Shell ovate, rather thick, very lightly striatulate; whitish with rather wide brown streaks, somewhat wavy and confluent with one another. Spire rather short, the apex obtuse, rather wide, white. Whorls 6½, a little convex, the suture crenulate, with scarcely any impressed line. Columella rather oblique, lightly arcuate, rather thick, distinctly truncate. Aperture oval, whitish inside, showing the streaks through; the outer margin slightly arcuate; basal lip arcuate. Length 57-72, diam. 35-41.5, aperture 33.5-41 x 21-26 mm. Apical angle 41 degrees. (*Martens*).

S. Africa: Transvaal, on the road from Delagoa Bay to Lydenburg. (Dr. Wilms, 1886).

A. zebrula v. MTS., Sitzungsberichte Gesell. naturforsch. Freunde zu Berlin, March 20, 1900, p. 118.

Very near *A. zebra* Chemnitz, and especially the var. *tigrina* Fér. (Histoire, p. 133), in markings agreeing better with var. *borniana,* in shape more with typical *zebra* Ch., but the whorls widening more rapidly than in either, and as it seems, remaining always smaller, for of 9 examples given by Dr. Wilms to the Berlin Museum, none exceeded 72 mm. long, and the smaller ones, 57 mm., give the impression of being full-grown shells, by the strong, not thin outer lip. *A. craw-*

fordi Morel. is more oblong, not so full beneath, more obtuse at the summit, and has much narrower streaks (*Mts.*).

15. C. SMITHII (Craven). Pl. 11, fig. 36.

"Shell ovately conical, thin, semitransparent, striated by the lines of growth, which, upon the upper whorls and upper part of the last whorl are crossed by coarse spiral striæ, producing a granulose, striated appearance; whorls 8, somewhat convex, the last occupying about half the entire shell; upper whorls of a dull orange-yellow, last whorl of a greenish-yellow, the whole marked with numerous irregularly waved stripes of a burnt-sienna color; spire somewhat elongated, apex obtuse; suture deep, aperture elliptically ovate, interior having a faint purple lustre and showing the stripes through the shell; columella arcuate, terminating in a small truncation; peristome simple. Length 55, greatest breadth 27, height of aperture 29½, breadth of aperture 15 mm." (*Craven*).

S. Africa: Leydenburg, Transvaal (Craven).

Achatina smithii CRAV, Proc. Zool. Soc. Lond. 1880, p. 617, pl. 57, f. 1.

This small member of the *zebra* group is named after Mr. E. A. Smith of the British Museum.

16. C. RHABDOTA (Melvill & Ponsonby). Pl. 27, fig. 37.

Shell ovate-oblong, thin, ochraceous-straw colored, the apex obtuse. Whorls 7, above decussate-granulose, the last similarly granulose to the middle, smooth from there to the base, and glossy; longitudinally decorated throughout with zebrine flames, the last whorl elongated. Aperture oblong; peristome thin, simple, the columellar margin truncate below. Length 45, diam. 20 mm. (*M. & P.*).

South Africa.

A. rhabdota M. &. P., Ann. and Mag. N. H. (7), i, p. 29, pl. 8, f. 11 (Jan. 1898).

"In form resembling *A. ustulata* Lam., though not quite so elongate; in markings like a miniature *A. zebra.* It does not seem to be a young shell, and we hardly conjecture that the species will be found to attain greater dimensions than that of the type before us. It is handsome, painted with longitudinal close-lying zebrine flames, dark brown on a straw-colored ground, the whole surface of the upper whorls and the upper portion of the last being delicately decussatedly granulose " (*M. & P.*).

The species seems related to *C. smithii* Craven.

III. *Group C. varicosa.*

Thin, light, ovate or *obesely ovate* shells, usually flammulate, more or less decussate above, and with a rather large apex.

17. C. VARICOSA (Pfeiffer). Pl. 26, figs. 30, 31, 32, 33.

Shell swollen-ovate (in the young, oblong-ovate when mature), thin, glossy; buff, lightning-streaked with broad, black-brown flames, and irregularly placed blackish varix-streaks. Spire turbinate, obtuse, granulated, the suture slightly crenulate. Whorls (in young shells) 5 to 6, a little convex, the last a little longer than the spire, striatulate, decussate with spiral striæ under the suture; (but adults have 7 slightly convex whorls, the upper minutely granulose-decussate, the following granulose on the upper half, the last whorl a little longer than the spire, striate, with almost obsolete impressed lines at the suture). Columella compressed, acute, lightly twisted, narrowly truncate. Aperture subvertical, oval, bluish and whitish within, and showing the stripes through; peristome simple, acute, blackish-margined.

Length 43, diam. 25, aperture 27 x 16 mm. (*Pfr.*).

Length 90, diam. 41, aperture 50 x 27 to 28 mm. (*Pfr.*).

S. Africa: Enon, north of Port Elizabeth (Hartvig).

A. varicosa PFR., Malak. Bl. viii, 1861, p. 73, pl. 2, f. 7, 8; Monogr. vi, p. 215 (young); Novit. Conch. p. 490, pl. 106, f. 12.

Pfeiffer's first description and figures applied to a specimen (pl. 26, figs. 30, 31) which he afterwards found was immature. He writes as follows: When Mr. Hartvig sent me the example described in 1861, he wrote me that larger ones could not be found, and those collected seemed to be full grown. But lately it has been proved that they were only the young, by large specimens found in the same place, one of which is here illustrated [pl. 26, figs. 32, 33]. As the addition of the last whorl gives the whole shell a more elongated egg-shape, the diagnosis of the species requires several alterations besides that of the dimensions. The fine granulation which covers the upper whorls disappears close over the succeeding suture upon those following, and is indicated on the last two whorls only by weakly impressed lines below the suture. The aperture is longer and the columella in some of the grown shells is more strongly concave than in the young.

18. C. CRAWFORDI (Morelet). Pl. 26, figs. 27, 28.

Shell short-ovate, ventricose, thin; pale yellow, profusely striped longitudinally with chestnut, the stripes narrow, partly irregular or slightly zigzag, partly straight and in the direction of growth lines; the first 3½ whorls pale fleshy and without stripes; surface finely decussate-granulate down to the periphery of the last whorl, the base nearly smooth. Spire short, the summit large and obtuse. Whorls 6½, convex, the suture deeply impressed and bordered with a crenulate whitish line. Aperture acuminately ovate, white and showing the bands through, the outer lip thin, columella somewhat concave, strongly or narrowly truncate below, whitish; parietal callous a mere transparent film.

Length 56, diam. 26 mm. (type).

Length 44.5, diam. 26 mm. aperture 27 mm. long.

S. Africa: Port Elizabeth (Jas. Crawford).

A. crawfordi MOREL., Journ. de Conchyl. 1889, p. 8, pl. 1, f. 3.—CLAPP, Nautilus xi, p. 69.

This handsome little species resembles *C. varicosa* in having the slightly oblique stripes interrupted at intervals by broader variceal streaks parallel to the growth-lines, and apparently marking the inception of a new period of growth-activity. In some specimens nearly all of the stripes are of this character, very few being noticeably oblique or zigzag.

Mr. Clapp found young shells of about 8 mm. diameter inside of a specimen in his collection; and as there were no traces of a calcareous egg-shell, it seems that the species is viviparous.

19. C. ÆDIGYRA (Melvill & Ponsonby). Pl. 26, fig. 29.

Shell oblong, compact, glossy, whorls 7, tumid, ventricose, smooth throughout, flat, one specimen almost uniform olivaceous, another decorated with longitudinal zebra flames. Aperture oblong, the peristome very thin, simple. Length of the unicolored specimen 2.25, diam. 1.30 inch. (*M. & P.*)

S. Africa: Craigie Burn, Somerset East (Mrs. Mary Layard Barber, *née* Bowker, in coll. E. L. Layard).

A. aedigyra M. & P., Ann. and Mag. N. H. (6) xiv, p. 92, pl. 1, f. 7 (Aug. 1894).

"Well characterized by the remarkably ventricose growth of the whorls."

20. C. CINNAMOMEA (Melvill & Ponsonby). Pl. 29, fig. 42.

Shell obese, tumid, semipellucid, thin, cinnamon-ochraceous. Whorls 6, the last rapidly increasing, tumid, longitudinally irregularly wrinkled, decorated here and there with brown flames. Aperture ovate-oblong; peristome thin, the lip milk-white within. Length of largest specimen 2.25, diam. 1.70 inch. (*M. & P.*)

South Africa: Standerton (Burnup).

A. cinnamomea M. & P., Ann. and Mag. N. H. (6), xiv, p. 92, pl. 1, f. 6 (Aug. 1894).

"A handsome species, obese, of a cinnamon horn-color, with darker brown longitudinal flames, irregularly disposed."

21. C. BISCULPTA (E. A. Smith). Pl. 13, fig. 44.

"Shell light and thin, ovate-acuminate above, clothed with a thin, yellowish-olive epidermis, beneath which it is dirty or bluish white, striped a little obliquely with narrow and slightly wavy reddish-brown streaks; suture almost horizontal, rather deep owing to a rotundity of the volutions; whorls 7½, very convex, the four apical ones pale, without stripes, all granulated, the granules on upper ones which constitute the spire rather coarse in close spiral series; the upper part of the body-whorl similarly granulated, the lower portion much more finely, the line of demarcation between the two kinds of granulation sudden and distinct. The mouth rather small, very irregularly oval, occupying a little more than half the entire length of the shell, dirty-white or bluish-white within, displaying the exterior reddish-brown striping; columella arched in the middle, tortuous below and abruptly truncated at the base, of a dirty-white color and covered with a very thin callous which extends over the whorl and joins the lip at its upper extremity." (*Smith*).

Length 46, diam. 25, aperture 25 x 13.5 mm.

South Africa (Smith).

A. bisculpta SMITH, Quart. Journ. of Conch. i, p. 349 (May, 1878).—ANCEY, Journ. de Conchyl. 1902, p. 280, fig. 8.

"This interesting species must not be mistaken for the young of *A. welwitschi* Morelet, to which it bears some resemblance. There are two specimens of it and apparently not quite adult. I imagine, however, that they would not grow much larger, but no doubt would become somewhat more solid" (*Smith*).

Ancey figures a shell which seems to him to be identical with the type of *A. bisculpta*, but the general tint is paler and there are no flammules (pl. 13, fig. 44). Mr. Smith's type has not been figured.

IV. *Group of C. dimidiata.*

Ovate shells with the apex rather large and rounded, the spire decussate, last whorl mostly smooth and glossy; *nearly uniform olivaceous, brownish* or *yellowish,* usually with a few streaks in the direction of growth-lines, but *without flames or stripes.*

22. C. DIMIDIATA (E. A. Smith). Pl. 32, fig. 6.

"Shell thin, light, divided into two differently colored portions, the upper section above the middle of the body-whorl being of a uniform dull-brown color and displaying very little gloss on the surface, the lower division is polished and greenish-yellow or olive, streaked here and there longitudinally with a darker tint. Whorls about seven in number, the upper ones moderately convex, and sculptured with somewhat coarse granulation, which is formed by the strongly marked oblique lines of growth being intersected by less pronounced spiral striæ; this granulose sculpture becomes almost obsolete on the upper half of the last volution and vanishes entirely below the middle. The aperture is large and occupies more than half the entire length of the shell; it is oval in form, acuminated above, and coated within with a bluish-white callous deposit; columella nearly perpendicular, curved very slightly in an outward direction and tinted with a very pale shade of livid pink. It is abruptly truncated below and invested with a thin callosity, which extends over the oral side of the whorl and joins the thin peritreme above. (*Smith*).

Length 80, diam. 39; aperture 45 x 26 mm. (*Smith*).

S. Africa: Eastern slope of the Drakensberg mountains, at Leydenburg Gold Fields, Transvaal.

A. dimidiata SMITH, Quart. Journ. of Conch. i, p. 348 (May, 1878); Ann. and Mag. vi, 1890, p. 392.—CRAVEN, P. Z. S. 1880, p. 616.

"The species is very readily distinguishable by the strongly contrasting colors of the upper and lower portions" (*Smith*).

The specimen figured measures, length 75, diam. 38, aperture 44½ mm.

23. C. SCHENCKI (Martens). Pl. 5, fig. 1.

Shell conoid-ovate, thin, rather glossy, irregularly costulate-striate and sculptured with fine, distant, impressed spiral lines; uniform brown. Apex obtuse, rather thick, whorls 7, the upper ones denuded of cuticle, separated by a slightly crenulate suture, the last whorl with the sculpture evanescent, paler below and towards the aperture. Aperture slightly more than half the length of the shell, bluish within, the columellar margin very arcuate, brownish, obliquely truncate. Length 72, diam. 32, aperture 40 x 25 mm. (*Martens*).

S. Africa: Macmac, near Leydenburg, in the Drakensberg region (Dr. A. Schenck).

Achatina schencki Mts., Sitzungsberichte d. Ges. naturf. Freunde zu Berlin 1889, p. 164; Conchol. Mittheil. iii, p. 8, pl. 43, f. 3 (1894).—*A.* "*schrencki* v. Mts.," Gude, Journ. of Malac. vii, p. 90 (Dec. 1899).

This species is very closely related to *C. dimidiata* Smith, from which the very concave columella (more like that of *C. burnupi*), separates it.

24. C. burnupi (E. A. Smith). Pl. 32, fig. 5.

Shell long-ovate, rather thin, covered with a glossy, yellowish-olivaceous cuticle, here and there ornamented with darker streaks, yellow at the suture, and girt about the middle of the last whorl with a dark belt. Whorls 8, slightly convex, the upper ones granulate, the last elongate, smooth, striated with slightly oblique growth-lines, slightly descending in front. Aperture inverse-auriform, pale bluish within, opalescent, half the total length of the shell. Columella rather straight, obliquely truncate in front, covered with a thin whitish callous. Length 71, diam. 39, aperture 35 x 18 mm. (*Smith*).

South Africa: Drakensberg, North of Natal, 5000-6000 ft. elevation (Henry E. Burnup).

Achatina burnupi Sm., Ann. and Mag. of Nat. Hist. (6), vi, p. 393 (Nov. 1890).

"This is a rather slender species, in general proportions somewhat resembling Reeve's representation of *Bulimus Thompsoni* (Conch. Icon. pl. 24, fig. 158). It is moderately thin and clothed with a yellowish-olive glossy epidermis, exhibiting at short intervals oblique streaks of a darker tint and close to the suture becoming decidedly yellow, so that the upper edge of the last whorl appears to be bordered with that colour. The three uppermost volutions, which have lost the epidermis, are pale brown; all the whorls except the last are sculptured with spiral and oblique striæ, forming a rather fine granulation. The body-whorl is rather long and ornamented only with lines of growth which are well marked and slightly puckered at the suture. A faint band is noticeable just above the middle, and several other transverse lines parallel with it are also observable on close inspection.

"This species resembles *A. simplex* Smith in the absence of colour-markings and in the size of the apical whorls, but differs entirely in its more elongate form. This is particularly apparent in the body-whorl and aperture.

"The above description is based on a single specimen recently presented to the British Museum by Colonel J. H. Bowker. It was collected on the Drakensberg, north of Natal, at an elevation of 5000 to 6000 ft., by Mr. Henry E. Burnup, after whom I have named the species." (*Smith*).

The specimen figured measures, length 66.5, diam. 33, aperture 36 mm., and has not quite 7 whorls, the first 4 denuded of cuticle and flesh-colored, the next 2 beautifully decussate; while fine, nearly obsolete spiral lines are barely traceable on the last whorl.

25. C. scævola (Melvill & Ponsonby). P. 34, fig. 11.

Shell *sinistral,* thin, subpellucid, pale ochraceous, oblong-ovate. Whorls 7, a little swollen, longitudinally flammulate with brown, microscopically granulose-striatulate, the striæ transverse, the last whorl nearly smooth beneath. Columella lightly twisted, truncate, brown. Aperture oblong, the lip thin. Length 2.35, diam. 1.25 inch. (*M. & P.*).

S. Africa: Transvaal (Mr. Bowker, in Layard coll.).

Achatina scævola M. & P., Ann. and Mag. N. H. (6), xii, p. 104, pl. 3, f. 2, August, 1893.

The last whorl appears almost smooth, although the striæ are traceable with a lens for some little distance below the suture.

26. C. simplex (E. A. Smith). Pl. 12, fig. 37.

"Shell rather thin, light ovate, clothed with shining olive-brownish thin epidermis, here and there streaked in an oblique direction with narrow stripes or lines of a deeper shade of the same colour; spire obtusely conical, terminated by a rounded, blunt apex, whorls 6½ gradually increasing, sculptured by oblique lines of growth, which are granulated on the upper portion of the whorls; the granules are oblong and vanish almost entirely on the lower third part of the upper whorls and are only traceable for a short distance below the suture on the body whorl. The extreme upper edge of the whorl bordering the suture is pale and crenulated; aperture irregularly ovate, acuminated above and produced only moderately below the truncature of the columella, equalling about half the entire length of the shell, somewhat iridescent, within bluish or vinous white; peristome thin, simple, everywhere arcuate; columella well arched in the middle and tortuous beneath, oblique but narrowly truncate at the base, covered with a whitish enamel faintly tinged with pink, which extends in the form of a very thin layer over the whorl to the termination of the outer lip.'' (*Smith*).

Length 50, diam. 26, aperture 25 x 16 mm.

Length 39, diam. 22, aperture 21 x 12 mm.

South Africa: Port Natal (Dr. P. Sutherland). Transvaal, between Delagoa Bay and Lydenburg (Dr. Wilms).

A. simplex Smith, Quart. Journ. of Conch. i, p. 350 (May, 1878).—v. Martens, Sitzungsber. naturforsch. Freunde, 1900, p. 119.

''This species is very distinct from any other with which I am acquainted. It is remarkable for the simplicity of its coloring, the rotundity of its whorls and its glossy surface'' (*Smith*).

27. C. transvaalensis (E. A. Smith).

''Shell oblong, thin, pale greenish-straw color; spire bluntly conical, terminated by an obtuse apex; whorls 7½, very convex, separated by a deep and almost horizontal suture, crenulated just beneath it and bordered by a very thin, yellowish line; the surface is everywhere (with the exception of the lower half of the body whorl which is smooth) covered with oblong granules, which are not very observable to the naked eye; the lines of growth are distinct and a little obliquely inclined; the aperture is small, being less in length than half that of the entire shell and of a diaphanous whitish color within; columella very much arched in the middle, tortuous beneath, abruptly truncated at the base, and the edge coated with a thin, white enamel.'' (*Smith*).

Length 38, diam. 17, aperture 17 x 9 mm.

S. Africa: Eastern slope of the Drakensberg mountains, at Lydenburg Gold Fields, Transvaal (Smith, Craven).

A. transvaalensis SMITH, Quart. Journ. of Conch. i, p. 351 (May, 1878).—CRAVEN, P. Z. S. 1880, p. 616.—MARTENS, Sitzungsber. Ges. naturf. Freunde, 1900, 119.

"This species in texture and color resembles in a degree *A. natalensis* Pfr., but its form is very different and the granulation rather finer. In shape and the proportion of the whorls it approximates *A. polychroa* of Morelet, but the volutions are much more convex and the columella is not straight" (*Smith*).

28. C. PENESTES (Melvill & Ponsonby). Pl. 28, fig. 40.

Shell ovate-pyramidal, much attenuated above, especially near the apex, whorls 6, under the lens granate-decussate, at the sutures impressed, the last whorl rapidly enlarging, smoother at the base, longitudinally irregularly wrinkled. Aperture ovate-oblong. Columella twisted and somewhat truncate. Length of largest specimen 1.30, diam. .75 inch. (*M. & P.*).

S. Africa: Pretoria (Wotton).

Achatina penestes M. & P., Ann. and Mag. N. H. (6), xii, p. 104, pl. 3, f. 3 (August, 1893).

"The shape is peculiar, ovate-pyramidal, the last whorl rapidly increasing, somewhat effuse, the other whorls small in proportion. The surface, excepting that of the basal half of the last whorl, which is smoothish though longitudinally wrinkled, granate-decussate."

The color, rather an important character in *Achatina*, is not described.

29. C. PARTHENIA (Melvill & Ponsonby). Pl. 12, fig. 38.

Shell oblong, glossy, smooth, thin, bright and pale straw-olive, suffused with flesh color above. Whorls 8, the apical ones immersed, globular, smooth, the rest impressed at the sutures, somewhat gradate, a little ventricose, the four upper whorls, after the apical ones, very minutely decussate under a lens, this sculpture nearly disappearing on the antepenultimate whorl, the last two smooth, glossy. Aperture ovate, the peristome thin, a little effuse, the columella somewhat truncate at the base, thin. Length 38, diam. 19 mm. (*M. & P.*).

S. Africa: Lower Umfolosi Drift, Zululand (Burnup).

A. parthenia M. &. P., Ann. and Mag. of Nat. Hist. (7), xii, p. 605, pl. 32, f. 10 (Dec., 1903).

"Of the same group as *A. penestes, transvaalensis* and *livingstonei,* but very distinct from all, differing both in form and coloration from any described species. The shining stramineous hue, with a blend of olive is peculiar; this is periostracal, the dead white of the shell itself showing through in occasional patches. The upper whorls with the aid of a lens are seen to be most finely decussate. This gradually becomes evanescent, till the last two whorls appear quite smooth" (*M. & P.*).

30. C. CHURCHILLIANA (Melvill & Ponsonby). Pl. 33, figs. 7, 10.

Shell pyramidal-fusiform, rather solid, obtuse at the apex. Whorls 7, somewhat tumid, subimpressed at the sutures. Above, at the sutures it is indistinctly granulate-striate, below flattened, smooth; covered with a thin ashen-ochraceous cuticle. Last whorl produced. Aperture oblong, the peristome simple. Length 3, diam. 1.5 inch. (*M. & P.*).

South Africa: Port Natal (G. C. Churchill, Esq., Owens College Museum, Manchester; A. Grout, Acad. N. S. Phila.).

A. churchilliana M. &. P., Ann. and Mag. N. H. (6) xv, p. 164, pl. 12, f. 3 (Feb., 1895).

"This plain-looking Achatina is doubtless one of the *natalensis* group, but we cannot identify it with any of the hitherto described species." The type is a broken shell (fig. 7).

Specimens of this species before me (pl. 33, fig. 10) measure from length 69, diam. 34, aperture 33 mm., to 66, 30, 32 mm. They are white under a thin straw-yellow cuticle. The decussate sculpture is well described as indistinct. On the last whorl the striæ are rather coarsely "gathered" at the suture, and spirals are absent. Whorls 7½, evenly convex, the last full below.

31. C. NATALENSIS (Pfeiffer).

Shell ovate-conic, rather solid, whitish, covered with a straw-colored epidermis; spire regularly conic, obtuse; whorls 7½, a little convex, the upper very minutely, the following more distinctly undulate-granulate; last whorl about as long as the spire, striate, decussated near the suture with a few spiral striæ. Columella arcuate, somewhat twisted, inflated, narrowly truncate. Aperture slightly oblique, acuminate-oval; peristome simple, thin. Length 62, diam. 28, aperture 31 x 17 mm. (*Pfr.*).

Port Natal (Plant in Cuming coll.).

A. natalensis PFR., P. Z. S. 1854, p. 294; Monogr. iv, 602.

V. *Species incertæ sedis.*

32. C. AURORA (Pfeiffer).

Shell oblong-ovate, solid, rather smooth, fulvous, variegated with sparse deep chestnut streaks. Spire conic, obtuse; suture margined. Whorls 6, a little convex, the last about equal to the spire. Columella very arcuate, purple, the base broadly truncate. Aperture a little oblique, sinuate-oval, lilac-rose colored within, glossy; peristome simple, brown-margined, the margins joined by a roseate entering callous. Length 59, diam. 28, aperture 33 x 16 mm. (*Pfr.*).

S. Africa: Port Natal (Cuming coll.).

A. aurora PFR., Proc. Zool. Soc. Lond. 1854, p. 294; Monogr. iv, 602.

This will probably prove to be no South African shell, but from West Africa, where many species have similarly colored interiors.

33. C. LINTERÆ (Sowerby). Pl. 29, fig. 43.

Shell ovate, thin, glossy, white, covered with a fulvous cuticle, painted in a single series above the middle with brown spots. Spire conic, the apex obtuse; suture impressed, subcrenulate. Whorls 7, a little convex, granose-plicate; last whorl inflated, obsoletely grano-plicate above, then smooth. Aperture vertical, subovate, white in the throat, blue margined. Columella nearly straight, dilute blue; peristome simple, thin, brown. Length 85, diam. 47 mm. (*Sowb.*).

S. Africa: Port Elizabeth.

A linteræ G. B. SOWERBY, Proc. Zool. Soc. Lond. 1889, p. 580, pl. 66, f. 11.

"A very handsome species, of which the type, at present unique, is in Miss Linter's collection. It is distinguished from its congeners chiefly by a conspicuous row of brown blotches a little removed from the suture" (*G. B. S.*).

34. C. DRAKENSBERGENSIS (Melvill & Ponsonby). Pl. 32, fig. 4.

Shell large, fusiform, delicate, glossy, the apex obtuse, whorls 8, impressed at the suture, a little ventricose; whitish covered throughout with a buff-olivaceous cuticle, except the apex; sometimes almost smooth, ornamented with zebrine brown-chestnut flames, the last whorl similar to the periphery, but from there to the base without markings. Sometimes the whorls are minutely granulate, the zebra-flames almost absent, marked only here and there with interrupted strokes or flammules, the last whorl similarly immaculate below the middle. Aperture oblong, bluish within, the outer lip thin, columellar margin sinuous, conspicuously truncate at the base. Length 3.25, diam. 1.75 inches (*M. & P.*).

S. Africa: Inhluzan, Drakensberg range, Natal.

A. drakensbergensis M. & P., Ann. and Mag. N. H. (6), xix, p. 636, pl. 17, f. 7, (June, 1897).

"A highly interesting form, two varieties of which are before us. The shell is fusiform, with ventricose whorls, somewhat impressed at the sutures; the ground-colour is white but with the exception of the apical whorls, a yellowish-olive epidermis more or less shining entirely covers the shell; this is ornamented with longitudinal zebra-like flames, more or less pronounced. In one specimen they are regular and entirely cover the surface till the middle of the last whorl, below which it is smooth, shining, and spotless. This variety is much smoother than the other, which is more or less covered with the minute cross granulations so common in members of this genus, while the zebra-like markings are almost obsolete. The mouth is oblong, within bluish, outer lip thin, rounded, columellar margin sinuous, markedly truncate towards the base." (*M. & P.*).

35. C. LIVINGSTONEI (Melvill & Ponsonby). Pl. 14, fig. 1.

Shell narrow, fusiform, thin, straw-colored, smooth, the apex obtuse. Whorls 7, a little impressed at the suture, somewhat ventricose, the last whorl longer than the rest, decorated with longitudinal chestnut zebrine flames, the flames straight in places, others branching or divaricating. Aperture ovate, the margin of the outer lip thin, columella truncate towards the base. Length 41, diam. 20 mm. (*M. & P.*).

South Africa: Kuruman, Bechuanaland (David Livingstone in coll. E. L. Layard).

A. livingstonei M. & P., Ann. and Mag. N. H. (6), xix, p. 636, pl. 17, f. 6 (June, 1897).

Seems to be allied to *A. pfeifferi* Dkr. and *A. polychroa* Morlt., and may prove to belong to *Achatina.*

Genus ARCHACHATINA (Alb.) Pilsbry, 1904.

Archachatina ALBERS, Die Heliceen, p. 189 (1850), in part. —HERRMANNSEN, Ind. Gen. Malacozoorum, Suppl., p. 11 (1852), type *A. sinistrorsa.*—*Achatina* sp. of authors.

The shell is ovate, of moderate or large size, with very obtuse, rounded summit, the protoconch being relatively very large and widening rapidly, the first whorl flat above, nearly smooth, the rest decussate-granulose; this sculpture usually diminishes in strength on the post-nepionic whorls. Whorls 5 to 7. Columella and aperture as in *Achatina,* or with the outer lip expanded. Oviparous, the egg-capsules very large, three to six contained in the uterus at one time.

Type *A. bicarinata* (Brug.).

Distribution, lands adjacent to the Gulf of Guinea, especially its north shore.

This genus differs from *Achatina* in the obtuse summit of the shell, caused by the great size of the protoconch, developed in a very large egg-capsule, of which but few are brought forth at a time. Moreover, the embryonic whorls, except the first, are sculptured. In *Achatina* the protoconch is small, trochoidal and smooth. *Archachatina* differs from *Cochlitoma* in the far more ample protoconch, and oviparous reproduction. *Archachatina* has a shell of fewer whorls than either of the other genera, in individuals of the same size. In many of the more accelerated species of *Archachatina* the decussate sculpture gives place on the last whorl to a smoothish surface; and the zigzag pattern of coloration may also be condensed upon the spire, the later portion having a secondarily simplified pattern.

Archachatina was proposed by Albers for the typical subgenus of *Achatina,* as that genus was then understood in a wide sense, that is, embracing *Pseudachatina, Perideris, Glessula,* Stenogyroid groups, etc.; this typical subgenus including the forms subsequently and up to the present time comprised in the restricted group *Achatina.* Ten years later the group was reduced to a synonym of *Achatina* by von Martens, a natural and proper course under the conditions then existing, for Albers' group covered species of all the groups now to be recognized in the dismemberment of the genus *Achatina.* In the meantime Herrmannsen in his classic work on molluscan genera (1852), had given Albers' first species, *A. sinistrorsa* (= *bicarinata*), as an example or type of *Archachatina.*

Under these circumstances it seems proper to restrict *Archachatina* to species having the essential structure of *A. bicarinata,* even though no such limitation was intended by Albers, or indicated by any subsequent author.

A. bicarinata, according to Rang, lays large oblong citron-yellow eggs, varying in size from 14 x 20 to 19 x 27 mm. The egg-shell is about .3 mm. thick. From three to five or even six are found in the oviduct at one time. *A. purpurea* also has large yellow eggs, the uterus containing four or five at once.

Key to Species of Archachatina.

I. Shell, sinistral, rough, 120-150 mm. long. *bicarinata* no. 1.

II. Shell dextral, surface even.

a. Moderately solid, opaque, interior and columella lilac or purple; exterior olivaceous, indistinctly marked or closely streaked; the early whorls usually pink.

b. Shell large, length more than 100 mm.; thick and solid; lip somewhat expanded.

c. Aperture purple; shell ventricose, 125x87 to 117 x 77 mm. *ventricosa,* no. 6.

cc. Aperture bright pink within, lip white-edged; 117 x 70 mm. *splendida,* no. 9a.

bb. Shell less thick, smaller; lip not expanded.

c. Last whorl very smooth; streaked with close, straight rufous streaks, often coalescent; aperture lilac, the lip not dark-bordered within; length 40 mm. *rhodostoma,* no. 9.

cc. Last whorl decussate above; aperture violet or purple, the lip dark-bordered within; 73 x 43 to 89 x 56 mm. *purpurea,* no. 7.

ccc. Last whorl decussate above; aperture lilac; 60x32 mm. *porphyrostoma,* no. 8.

aa. Rather solid; aperture white or nearly so inside.

b. Columella white, very concave; lip expanded and thickened within; length 100-130 mm. *marginata,* no. 2.

bb. Columella red or purple.

c. 105 x 55 mm.; solid, olivaceous-buff. *grevillei,* no. 5.

cc. 101 x 50 mm. *gracilior,* no. 2a.

ccc. 65 x 35 mm.; thin, smooth, yellowish with narrow streaks or maculate; columella orange flesh-colored. *ovum,* no. 3.

cccc. 84 x 52 mm. *subsuturalis,* no. 2b.

ccccc. 77 x 40 mm. Solid with broad dark stripes, confluent below; columella rose-tinted below *cumingi,* no. 4.

aaa. Shell thin or fragile, usually boldly marked; aperture white, lilac or bluish within, the flames showing through.

b. Columella red or purple.

c. Fulvous obsoletely marbled with chestnut; 66 x 30 mm. Columella with a purple line; whorls 5½. *papyracea,* no. 11.

cc. Yellowish-green, with wide, deep chestnut stripes, narrow above and few reaching the suture, early whorls roseate; columella short, narrow, quite concave and crimson; 68x35 mm. *adelinæ,* no. 11a.

ccc. Yellow with vivid dark brown stripes; col. slightly arcuate, purple; 66 x 30 mm., whorls 6½. *bayoli,* no. 12.

bb. Columella whitish.

c. Olive-yellow, profusely zigzag-streaked and dotted with chestnut; densely, finely and distinctly granulose; 48x27 to 55x32 mm., whorls 5. *siderata,* no. 10.

cc. Greenish-yellow, with chestnut flames, wider, confluent and blackish at base; a tessellate border below suture; early whorls rose; 72 x 39 to 41 mm. *knorri,* no. 13.

ccc. Last whorl *granulose-decussate throughout;* 80 x 40 to 90 x 50 mm., whorls 6. *camerunensis,* no. 14.

Group of A. bicarinata.

The large, solid shell is rudely striate, sinistral, bluish-white inside, with the columella very obliquely truncate or strongly sinuous.

1. A. BICARINATA (Bruguiere). Pl. 46, fig. 1; pl. 19, fig. 27.

Shell sinistral, ovate-fusiform, obtusely angular at the periphery and a short distance below the suture; solid and strong, ashy-bluish with inconspicuous brown streaks, the spire brown, variegated with whitish, early whorls dirty-white or brown; the suture has a whitish border below. Surface dull, rudely marked with growth lines and folds, more or less distinctly decussate below the suture, sometimes throughout. Whorls 6½ to 7, convex. Aperture blue-white with a pearly luster within, quite oblique. Outer lip unexpanded, thin, with a wide brown border within, columella not really truncate below, but deeply recurved to join the effuse basal lip. Parietal callous blue-white.

Length 120, diam. 67, aperture 73 mm.

Length 150, diam. 75 mm. (Dohrn.).

Ilha do Principe (Prince's Island), in the uninhabited mountain forests of the southern half of the island, on the ground, (Dohrn). Island of St. Thome at Roca Boa Entrada, Rio do Ouro and Ilheo das Rolas (Greef); Roca Rocio, at 570 meters elev. (Moller); Morro do Gentio and Roca Minho (Newton).

Bulimus bicarinatus BRUG. Encycl. Méth. i, p. 359 (1792). —*Helix bicarinata* FER., Prodr. p. 49, no. 350; Hist., pl. 128. —RANG, Ann. Sci. Nat. xxiv, p. 23.—*Achatina bicarinata* LAM. An. s. Vert. vi, p. 129; edit. Desh. viii, p. 296—REEVE, Conch. Syst. ii. pl. 178, f. 13; Conch. Icon. v, pl. 5, f. 17.—KUSTER, Conch. Cab. pl. 15, f. 3, 4.—MORELET, Voy. Welwitsch p. 64.—CROSSE, J. de Conch. xvi, 1868, p. 133.—DOHRN, Malak. Bl. xiii, 1866, p. 120.—GIRARD Jornal de Sci. Math., Phys. e Nat. iii, 1893, p. 109.—*Bulla achatina sinistrorsa* CHEMNITZ, Conch. Cab. ix, p. 28, pl. 103, f. 875-6. —*Achatina sinistrorsa* PFEIFFER Monogr. ii, 248; iii, 482; iv, 600; vi, 211; viii, 271; Conchyl. Cab. p. 305; Novit. Conch. p. 313, pl. 76, f. 1 (var. *carnea*).—DESH in Fér., Hist., p. 154, pl. 127 *A. B.* (soft anatomy).

Dohrn, who collected this species on Prince's Island, writes as follows:

The color of the common variety is slate-blue verging into black, the first whorl dirty-yellow, with broad brown flames, the suture broadly bluish-white. Sometimes the shell, especially the lower whorls, is white-striped, but always quite irregularly and raggedly so. In a few cases I have found remains of a caducous horny cuticle. The cuticle, white stripes, and the bluish ''bloom'' which overlays the shell like that of an untouched plum, are wanting in almost all collection specimens, for the dealers' cleaning, with acid, etc., has here as in other cases, only too often destroyed the true characters in an endeavor to beautify.

This species is a regular article of trade, being universally eaten. It is therefore scarcer than it must have been in Rang's time. In the town, five were worth the price of a fowl. They differ only slightly in taste from *Helix pomatia.* Most specimens in collections are reddish-brown, from loss of the external coat. The surface shows a peculiar granulation in places. Rang obtained an albino individual, and Dohrn a couple of pale flesh-colored ones, on Prince Island. One of these has been figured by Pfeiffer under the name var. *carnea* (pl. 19, fig. 27). It is apparently a variation rather than a variety.

A dextral specimen was taken by Newton on St. Thome.

Group of A. marginata.

The shell is dextral, solid, white or blue-white within, the columella and parietal wall are whitish, roseate or purple.

2. A. MARGINATA (Swainson). Pl. 24, figs. 22, 23; pl. 25, fig. 26.

Ovate, solid and strong; yellow, marked with broad streaks or serrate stripes of rich chestnut or blackish chestnut, and typically more or less dappled between them; early whorls pale roseate. There is usually at the periphery an indistinct line, or a change to darker color below. The surface, nearly smooth to the eye, or showing faint spiral lines, has a fine woven texture under the lens Whorls 7, moderately convex, but concavely impressed below the suture, and marked with one or two grooves, defining a narrow subsutural margin. The suture is either even or finely crenulate. Apex very obtuse, the flames beginning on the fourth whorl. *Aperture large, blue-white inside.* Outer and basal *margins expanded, thickened within,* bevelled. Columella white, very concave, prominent below.

Length 100, diam. 59, length aperture 61 mm.

Length 127, diam. 74, length aperture 78 mm.

Length 125, diam. 79, length aperture 84 mm.

West Africa: Guinea (Swainson); banks of the Niger. (Morelet). Gabun and Dahomey (coll. A. N. S. P.). Kamerun at Massaka, Mekango, Etome and N'dian (Duzen); Victoria (Buchholz); Barombi, Bula (Preuss). Loango coast at the mouth of the Quillu, northward from Loango (Mechow).

Achatina marginata SWAINS., Zoological Illustrations i, pl. 30 (1820-21); Malacology p. 170, f. 23.—PFR., Conchyl. Cab. *Achatina*, p. 328, pl. 29, f. 1; Monogr. ii, p. 249; vi, 212. MORELET, Voy. Welwitch, p. 65, no. 23; Sér. Conch. i, p. 19. (Gabon).—SEMPER, Reisen im Archip. Phil., Landmoll, p. 144 (anatomy).—v. MART. in Albers, Die Hel. 1860, p. 201, with var. *gracilior;* Monatsber. Akad. Berlin 1876, p. 257, pl. 2, f. 1 (living animal); Jahrb. d. D. Malak. Ges. 1882. p. 245; Sitzungsber. Ges. naturf. Freunde Berlin 1891, p. 30, 33.—d'AILLY, Bihang etc. p. 61, 69 (fig. of teeth).—*Helix marginata* RANG, Ann. Sci. Nat. xxiv, p. 33.—*Helix amphora* FER., Prodr. p. 50, no. 352 (nude name), and p. 70, where *marginata* Sw. is given as a variety.

This abundant species is distinguished by its expanded lip, large white mouth, relatively smooth surface and obtuse summit. The type of Swainson seems to have been a small example, his figure measuring 104 mm. long. It is white-mouthed, and rather narrowly striped.

Both size and markings vary widely. The largest shell before me measures 140 mm. long. If the large form proves to be varietally separable, it should be called var. *amphora* (pl. 25, f. 26). Fig. 22 of pl. 24 represents a young shell of four whorls, natural size.

D'Ailly remarks that there are two forms in the Kamerun. The larger, which measures up to 140 mm. long and about 70 wide, is characterized by spiral striation on the upper whorls. The color is brown flamed, here and there violet, and broken into dots. The summit and columella generally lack rose color, the aperture is bell shaped, and the basal margin descends deeply below the columella. The smaller variety is

2*a*. Var. GRACILIOR v. Martens.

Without violet markings; less distinctly striated spirally, the striæ frequently broken into granulation; basal margin of the lip less deeply arcuate. *Columella intense rose or reddish golden,* the summit of the shell similarly colored. Length 101, diam. 50, length of mouth 60 mm. Type from "Axim, in South Africa," Albers coll. Also reported from Kamerun by d'Ailly.

The status of this form requires further investigation.

2b. Var. SUBSUTURALIS Pilsbry, n. n. Pl. 25, fig. 25.

Ovate-conic, rather thick, decussate-granulate in the upper whorls, the last one very smooth; *purple at the apex,* then white, under a tawny-buff cuticle, ornamented with close, narrow, wavy chestnut streaks. Spire conic, rather acute; *suture margined, scarcely crenulate.* Whorls 7, a little convex, the last *much exceeding* the spire in length. Columella callous, *purple,* shortly and abruptly truncate. Aperture ovate-oblong, white inside; lip blackish within, unexpanded, arcuate below. Length 42, diam. 26 lines (*Phil.*).

Bulla achatina var. *marginata* DONOVAN, Naturalist's Repository v, pl. 149 (1827).—*Achatina suturalis* PHIL., Abbild. iii, p. 29, Achatina pl. 2, fig. 1 (April, 1849).—Not *Achatina suturalis* Pfr., 1848.—*A. marginata* Sw., REEVE, Conch. Icon. v, pl. 4, f. 14.

Philippi's figure, which I have copied, represents a shell not fully mature. The race is chiefly characterized by its red columella. Cf. var. *gracilior.*

3. A. OVUM (Pfeiffer). Pl. 24, figs. 20, 21.

Shell ovate, thin, smooth, tawny-buff painted with narrow reddish streaks, frequently interrupted and maculose. Spire conic, flesh-colored above, obtuse; suture widely margined. Whorls 6, a little convex, the upper ones minutely granulate under a lens, the last a little longer than the spire, ventricose. Columella orange flesh-colored, arcuate-twisted, slightly truncate below. Aperture ample, slightly oblique, broadly angulate-oval, colored within like the outside, somewhat pearly.

Peristome simple, thin. Length 65, diam. 35, apert. 38 x 22 mm. (*Pfr.*).

Habitat unknown. Type from Mus. Cuming.

Achatina ovum PFR., Malak. Bl. v, 1858, p. 238; Novit. Conch. p. 154, pl. 40, f. 3, 4 (*A. orum* on plate); Monogr. vi, p. 215.

Known by the unique type only. It is marked externally like *A. rhodostoma* Phil.

4. A CUMINGII (Shuttleworth).

Shell ovate-oblong, solid, striate, obsoletely decussate with punctate lines. Under the cuticle it is whitish-yellow, ornamented with broad brown or blackish-chestnut stripes, confluent at the base of the last whorl. Spire ovate, the apex obtuse, roseate. Whorls 6, a little convex, the last nearly five-eighths the total length, slightly inflated, the suture margined. Columella arcuate, rose-tinted basally, obliquely truncate. Aperture semioval, pearly inside; peristome simple, unexpanded, somewhat thickened, the margins joined by a glossy whitish callous. Length 77, diam. 40, aperture 40 x 26 mm. (*Shuttl.*).

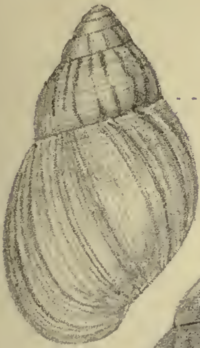
West coast of Africa (Cuming).

Achatina cumingii SHUTTL., Mittheil. der naturf. Ges. Bern, 1852, p. 201.—PFR., Monogr. iii, p. 482.

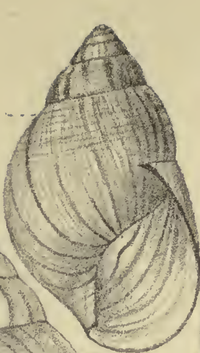
Two specimens examined. It is related to *A. suturalis* Phil. (*A. marginata* var. *columella rosea* of authors), but is more slender, the columella is more arcuate and the shell much less inflated. (*Shuttl.*).

5. A. GREVILLEI (Pfeiffer).

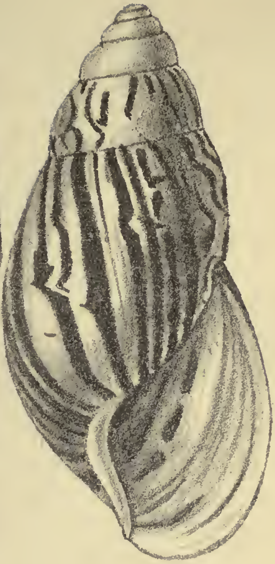
Shell ovate-oblong, solid, striatulate, olivaceous-buff under a thin brownish cuticle. Spire conic, obtuse; suture crenulate widely impressed-marginate. Whorls 6 to 7, the upper very minutely decussate, last whorl longer than the spire, nearly smooth, obsoletely angular at the periphery. Columella somewhat twisted, purple, narrowly truncate. Aperture slightly oblique, angulate-oval, pearly-whitish within; peristome thin, a little expanded, the margins joined by a purple callous,



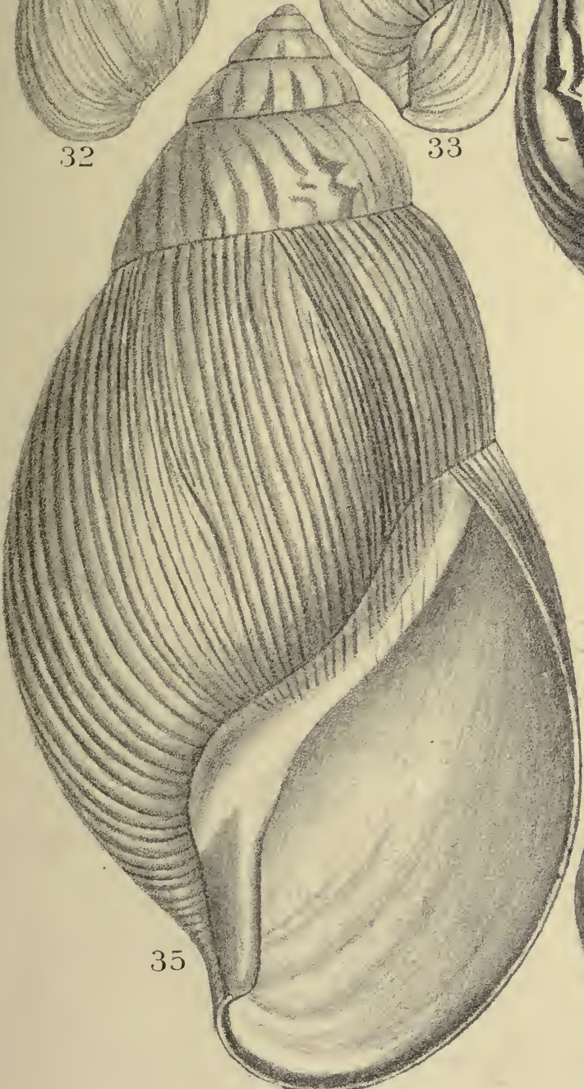
32



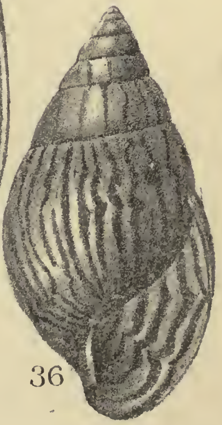
33



34



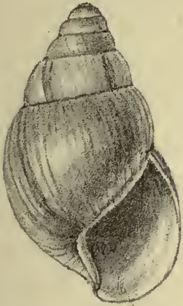
35

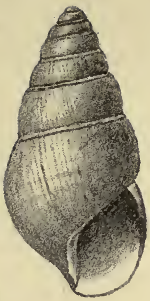


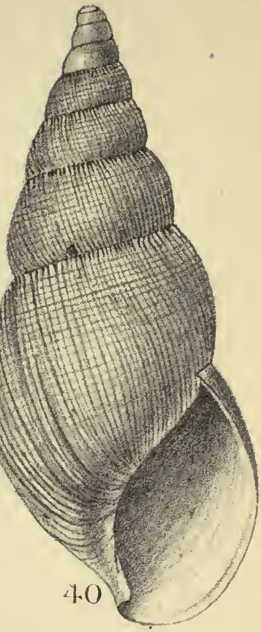
36

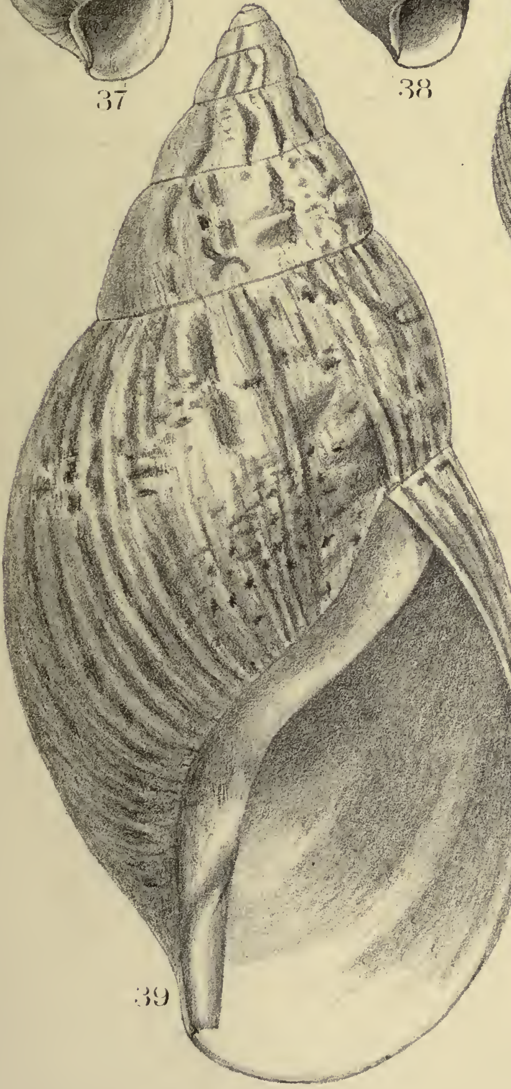
Achatinidæ

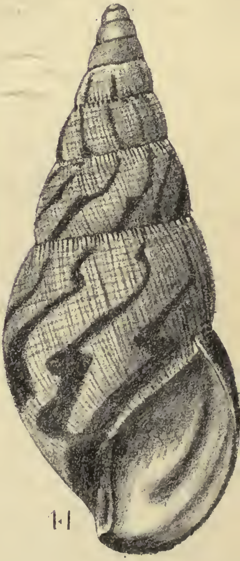
PLATE 12

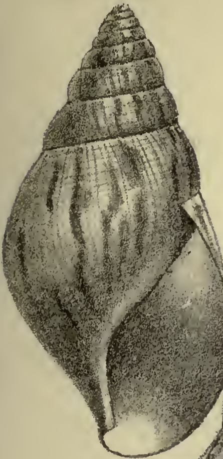

37


38

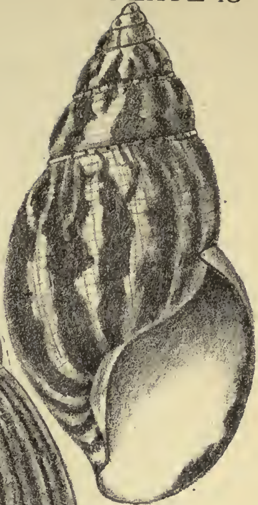

40


39

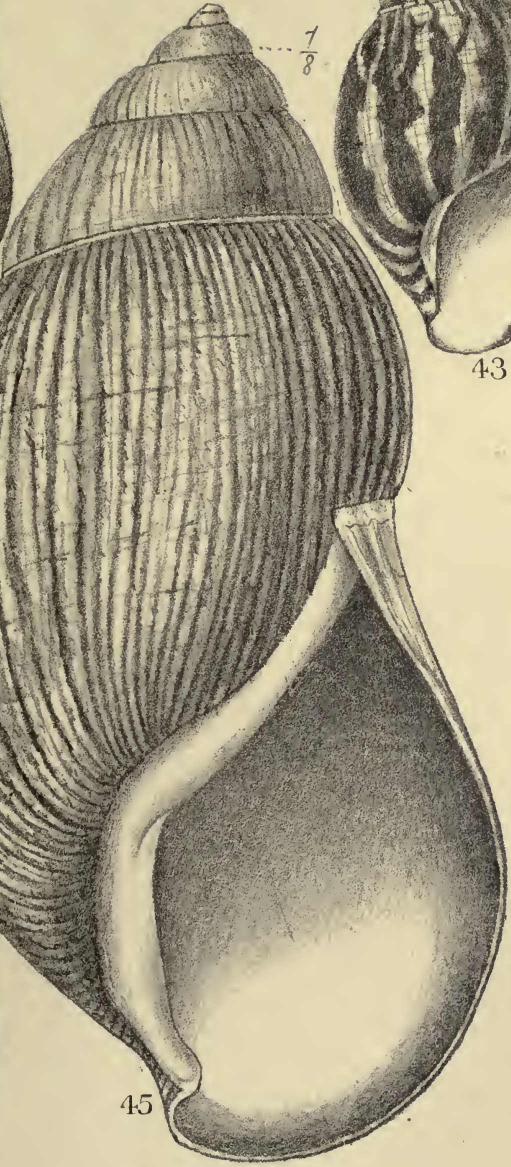

41



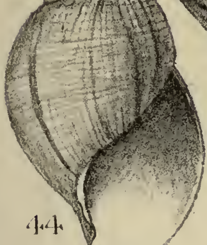
42



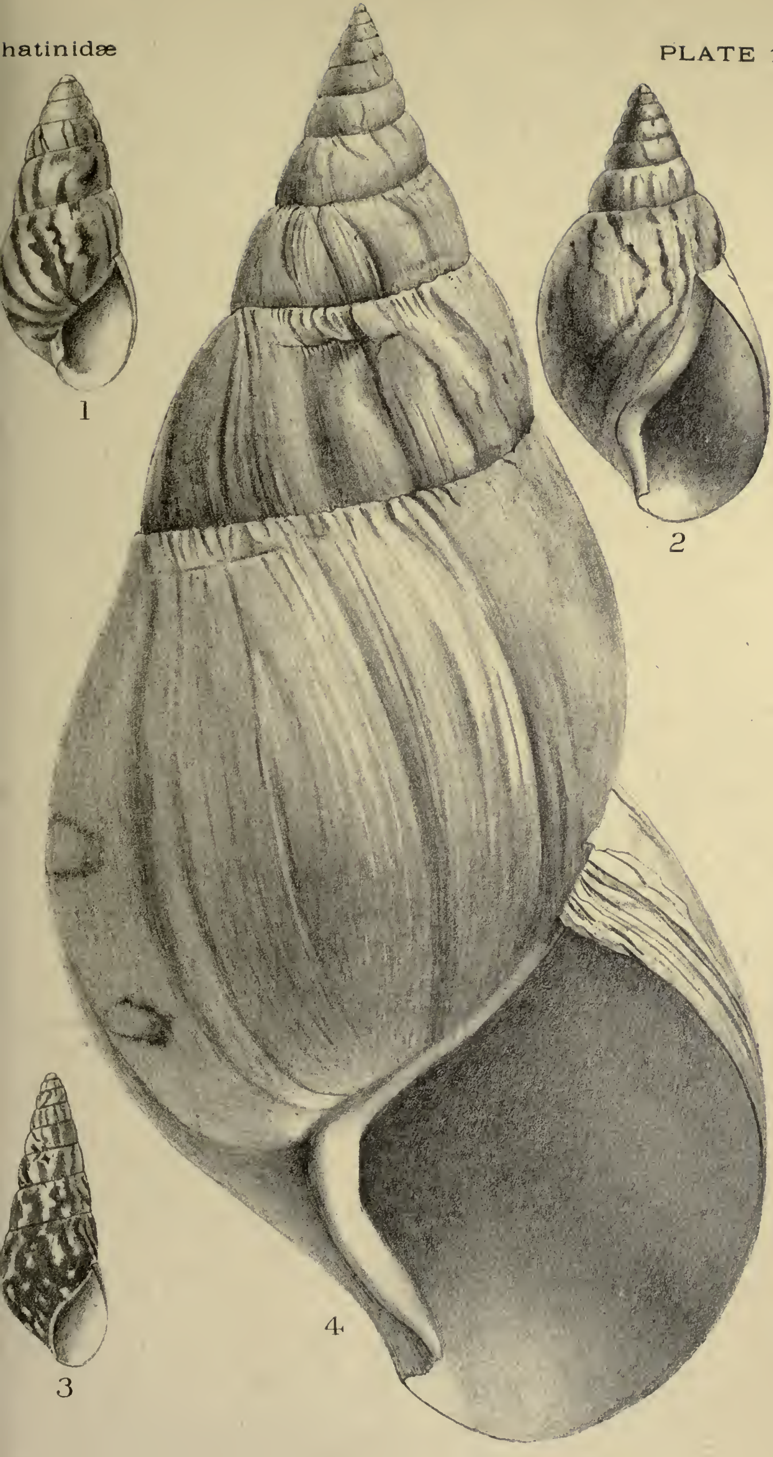
43

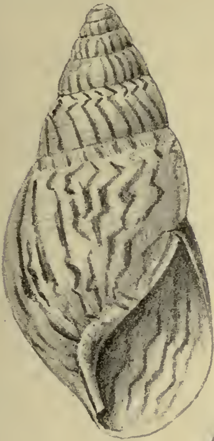


45

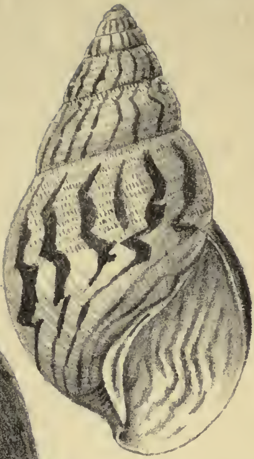


44

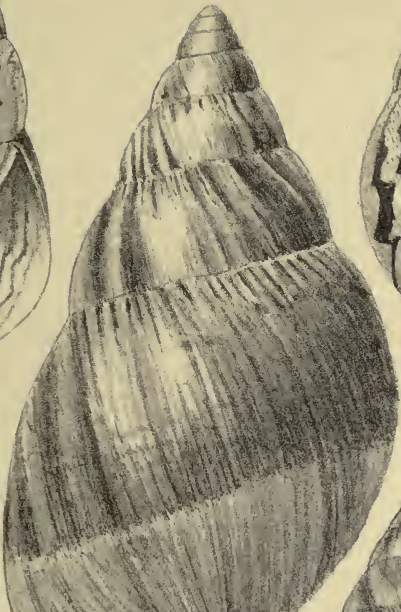

1
2
3
4



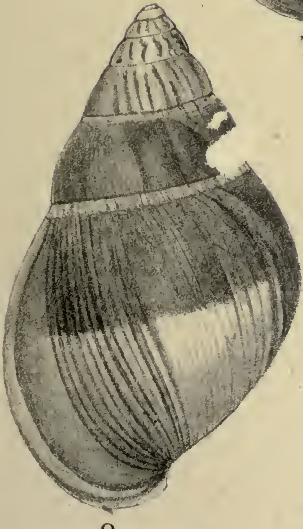
5



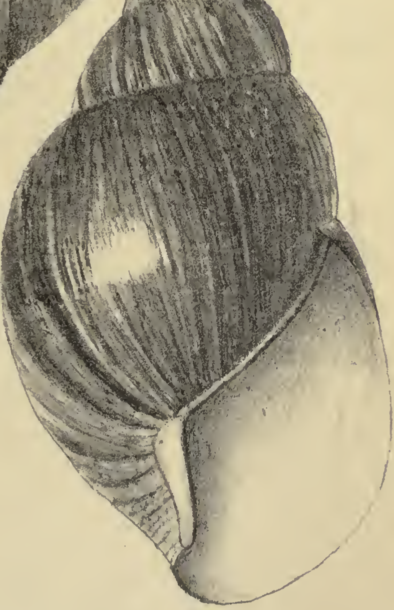
6



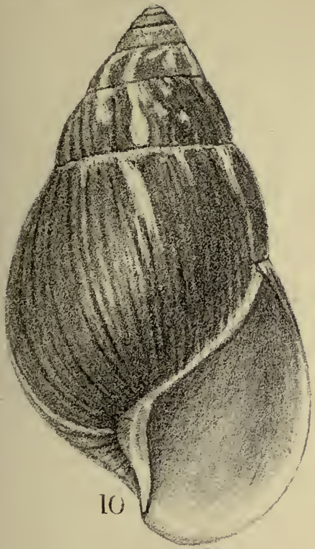
7

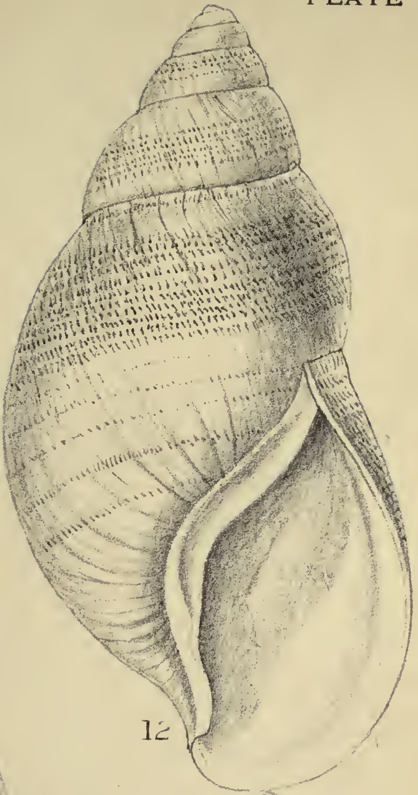


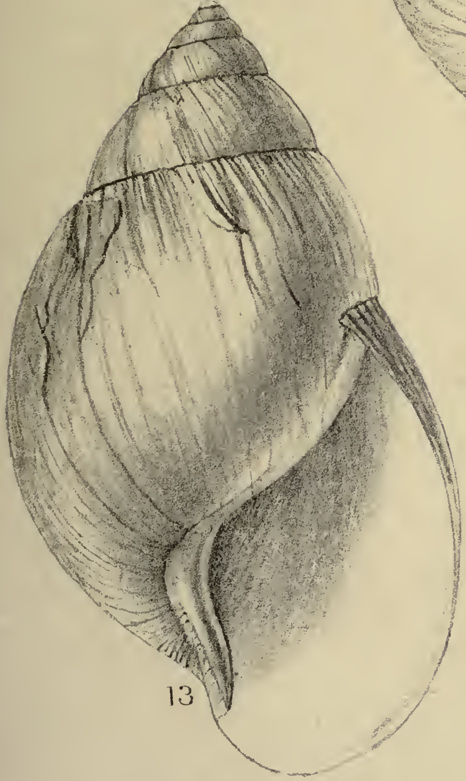
8

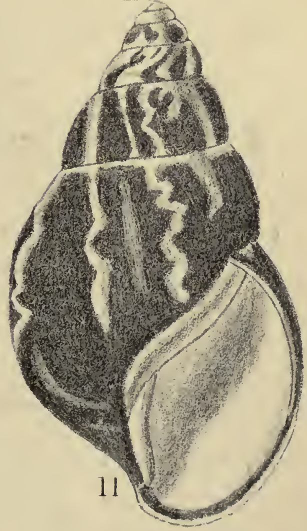


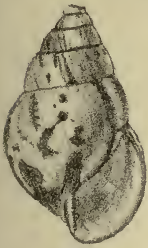
9

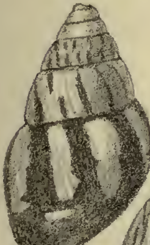

10

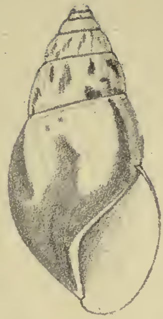

12


13

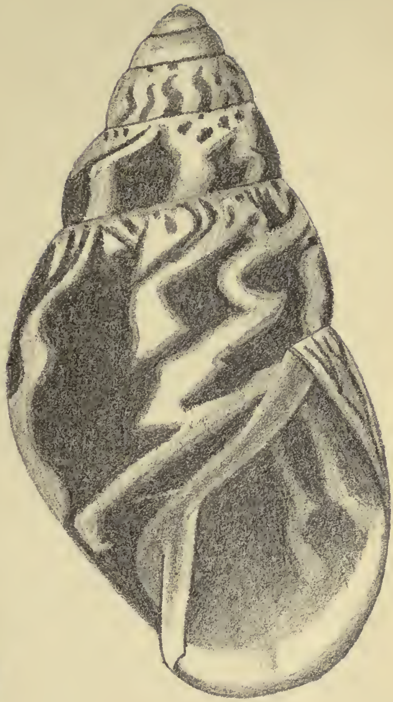

11



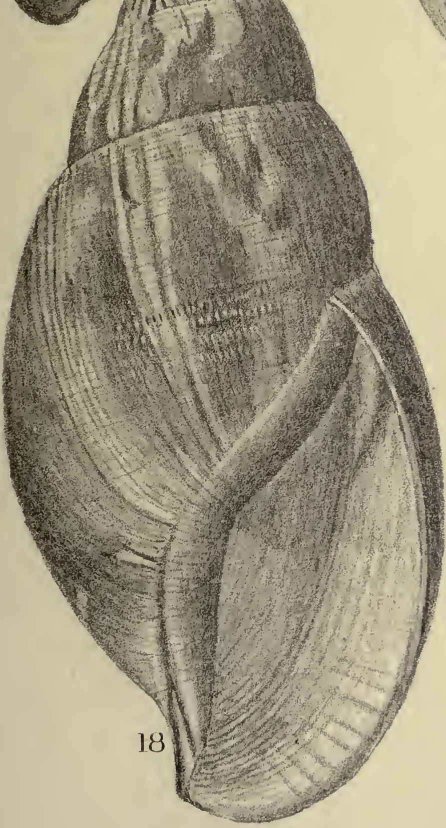




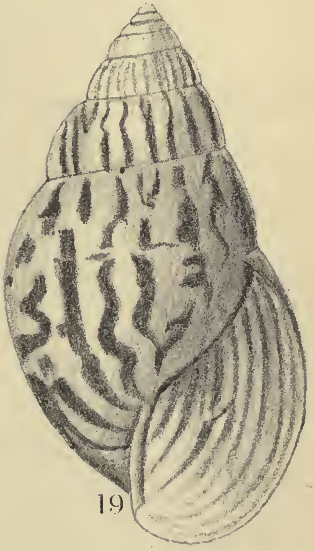
16



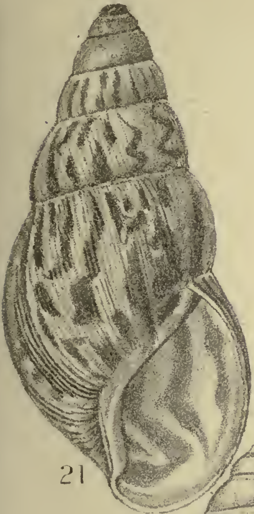
17



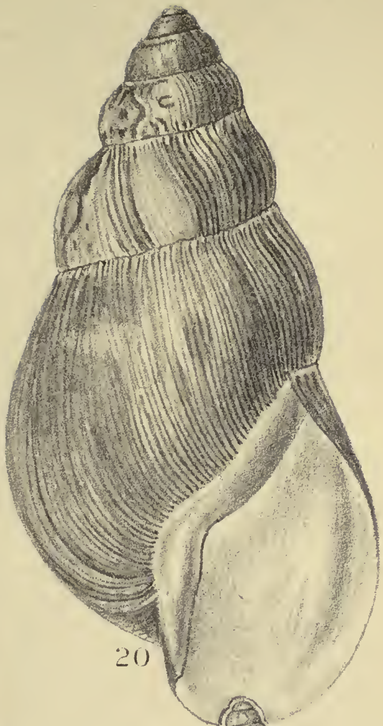
18



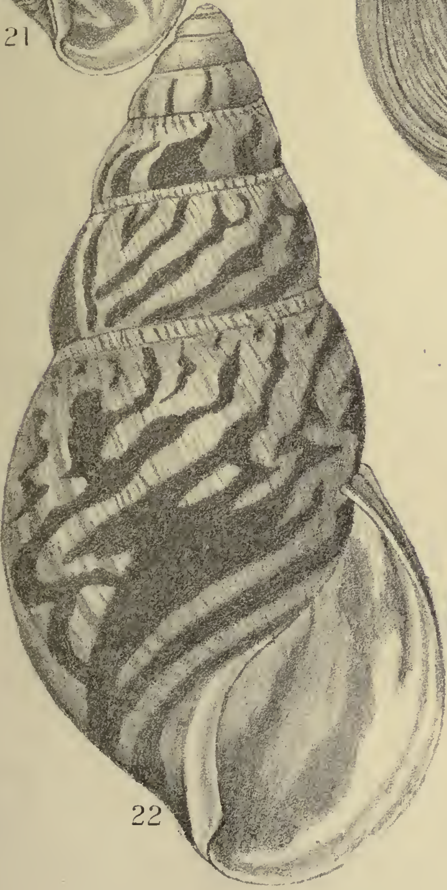
19



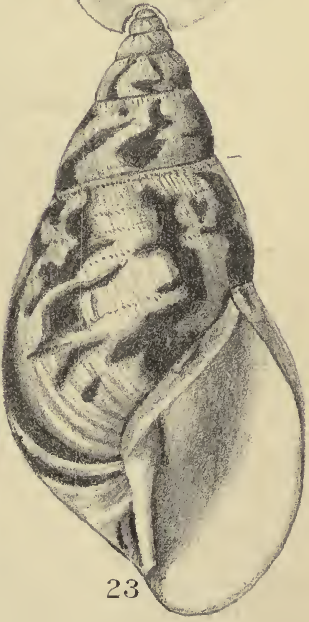
21



20



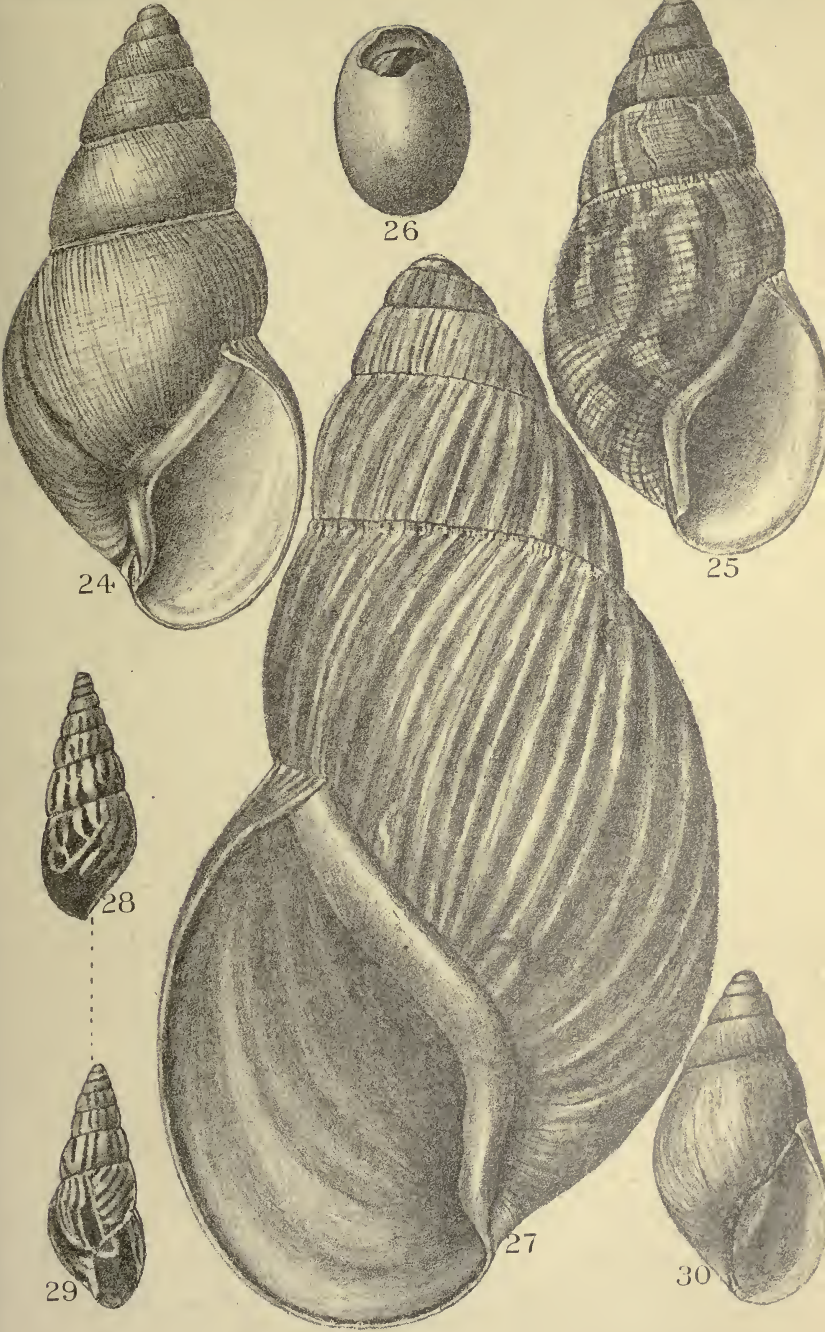
22

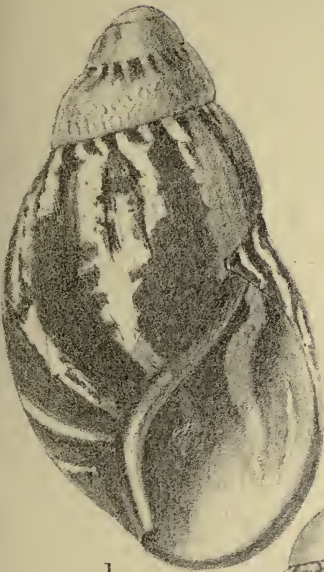


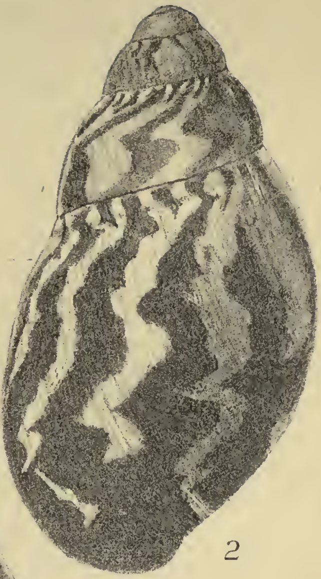
23

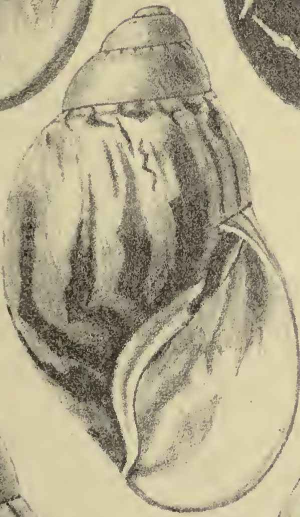
Achatinidæ

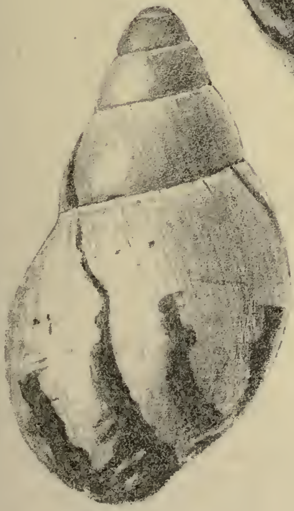
PLATE 19

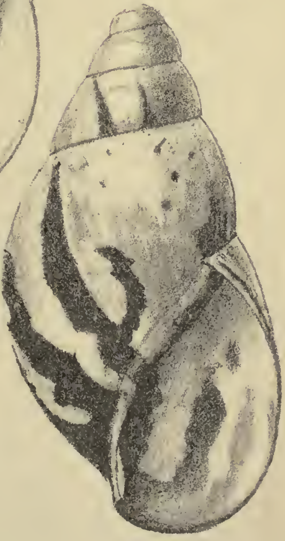

24
26
25
27
28
29
30

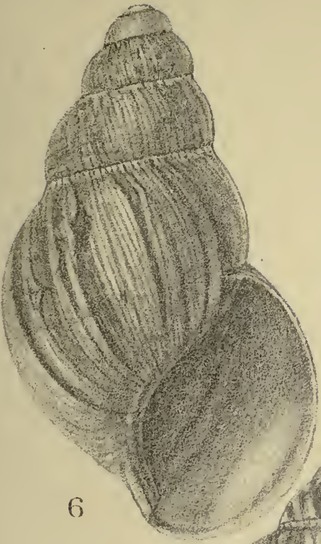

1


2

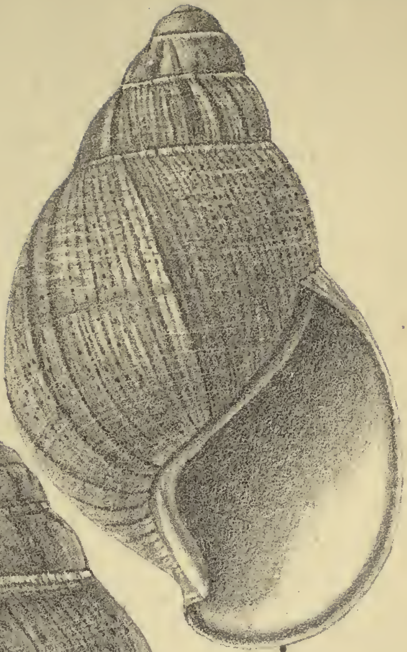

3


4

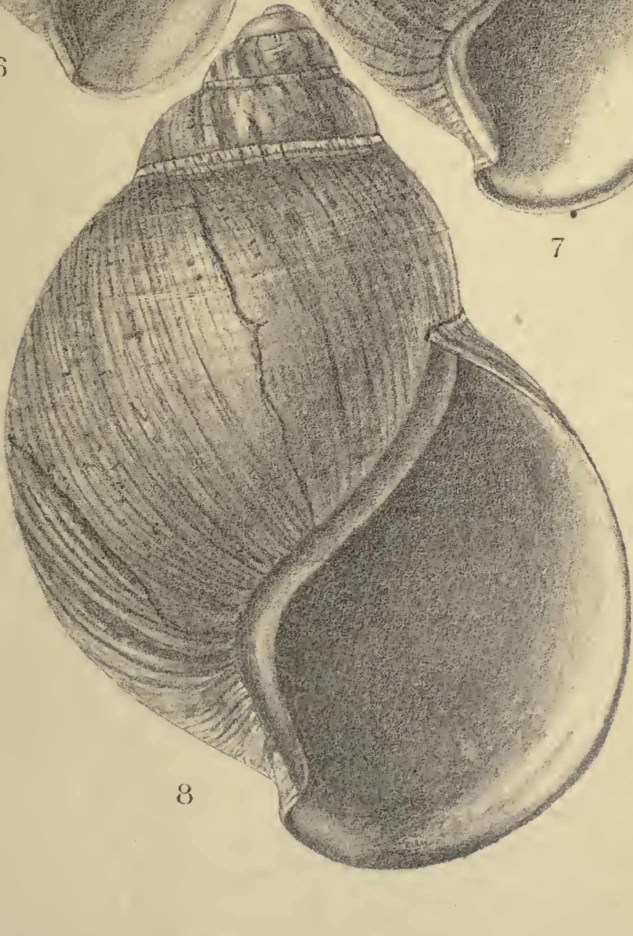

5



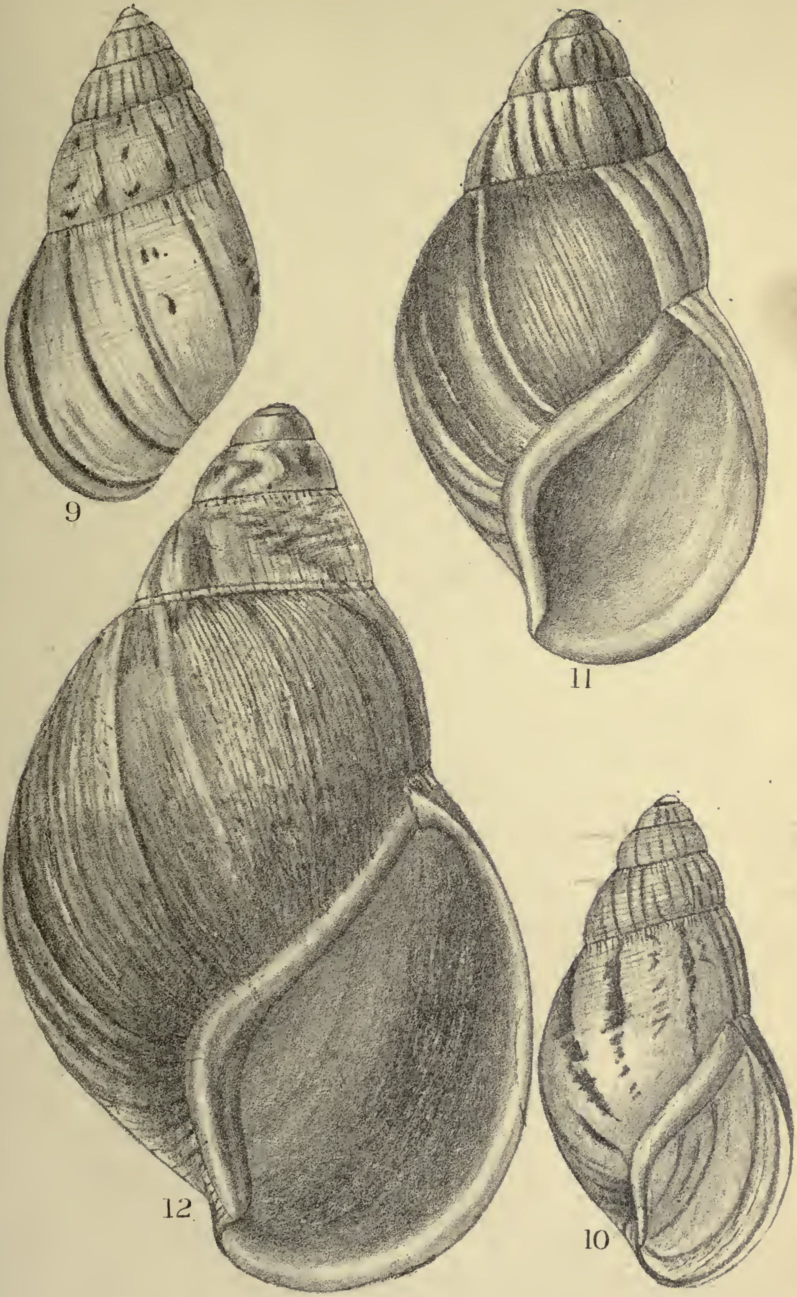
6



7



8

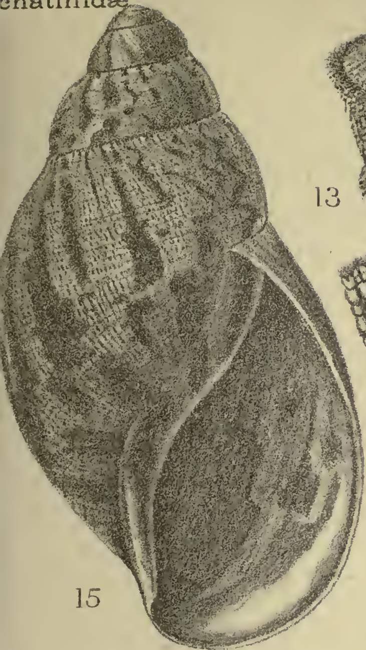


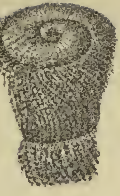
9

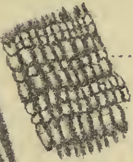
11

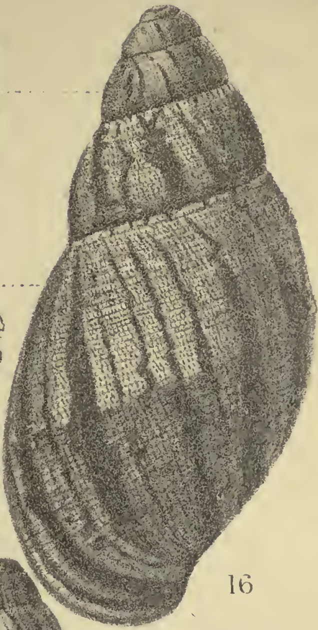
12

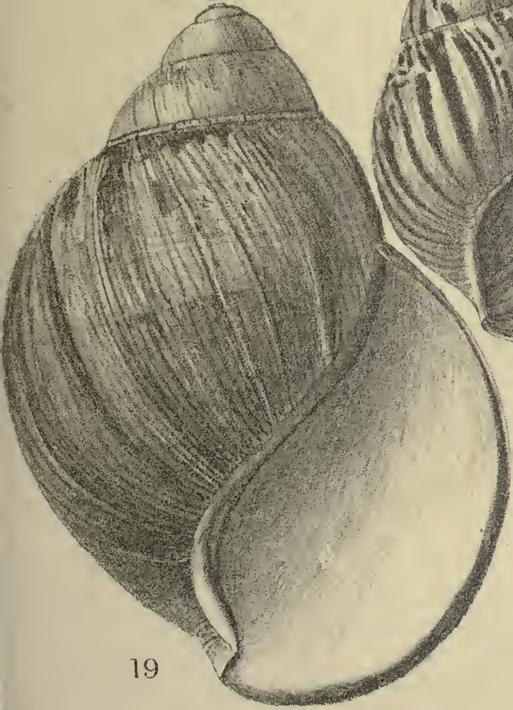
10

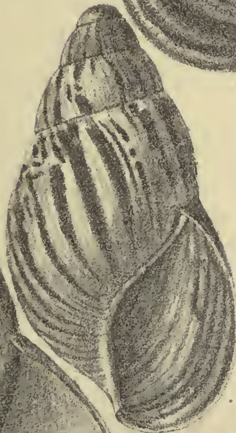

15

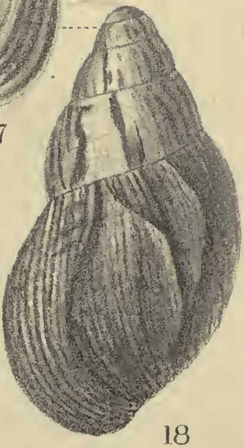

13


14


16


19


17


18

15-2137-25

paler above, right margin expanded. Length 105, diam. 55 mm., aperture 66 x 36 mm. (*Pfr.*).

West Africa: Old Calabar (Cuming coll.).

Achatina grevillei Pfr., P. Z. S. 1860, p. 138; Malak. Bl. viii, 1861, p. 78; Monogr. vi, 213.

The systematic position of this species is unknown to me. It has not been figured.

Group of A. purpurea.

The shell is solid or at least moderately strong, the interior and columella lilac or purple. Lip usually not expanded. Liberia to Kamerun.

6. A. ventricosa (Gould). Pl. 21, fig. 8; pl. 23, fig. 19.

Shell large, solid, conic-ovate; greenish-corneous, longitudinally obscurely flammulate, granose-reticulate; spire conic, whorls 6½, convex, the last ventricose, obtusely carinate; suture subcrenulate. Aperture rounded-ovate, about three-fifths the length of the shell; lip expanded, thickened inside, the submargin and columella glossy purple; columella very arcuate. Length 5, width 3½ inches; aperture 3 inches long, 1¾ wide. (*Gld.*).

Closely allied to *A. purpurea,* but the form is constantly more ventricose, and by comparing an extensive series, including the young, the difference is plainly not accidental. The color is more mixed with green and less conspicuously flammulated, and often flecked with triangular pale spots, and the aperture more of a blood red. Dr. Perkins says it is only found in the interior, while *A. purpurea* is found near the sea. (*Gld.*).

West Africa: Liberia, in the interior (Dr. Perkins).

Achatina ventricosa Gld., Proc. Bost. Soc. N. H. iii, p. 195, (April, 1850).—? *A. purpurea* Reeve, Conch. Icon. v, pl. 4, f. 15a.—? *Duennschalige Kinkhorn* Knorr, Vergnuegen der Augen und des Gemueths etc. iv, p. 39, pl. 24 * * *, f. 1 (1769).

The specimen figured on pl. 23, fig. 19 is not mature. It is labelled Taboo, W. Africa, and measures, length 87, diam.

59, length of mouth 59 mm. The last whorl is indistinctly angular peripherally, and finely decussate-granose throughout.

The larger specimen from Cape Palmas, figured on pl. 21, fig. 8 is quite solid and heavy, granulose throughout, but more finely so than *A. purpurea.* The early whorls are pink. Length 117, diam. 77, length of aperture 71 mm.; whorls 6¾. It is much more ventricose than any specimen of *A. purpurea,* and is also larger and more solid. The outer and lower margins of the lip are noticeably expanded.

7. A. PURPUREA (Gmelin). Pl. 21, figs. 6, 7.

Ovate, moderately solid. Last two whorls yellow or greenish-yellow with indistinct blackish or reddish streaks and usually scattered dusky dots; first three whorls usually pink. Surface *finely decussate-granulate,* the granulation becoming obsolete at the base. Whorls 6 to 6½, convex, *impressed below the suture* and scored by a line or lines defining a sutural margin. Apex very obtuse. Aperture oblique, typically *violet inside, but usually purplish crimson,* the lip and columella of the same color, with a *narrow purple-brown margin.*

Length 73 diam. 43, length aperture 41 mm.

Length 89 diam. 56, length aperture 53 mm.

West Africa: Liberia, Cape Mesurado to Sino (Rang); Cape Palmas (A. N. S. P.); Schieffelinsville (Buttikofer).

Bulla purpurea GMEL., Syst. Nat. (13), p. 3433 (1790). —DILLWYN, Catal. i, p. 495.—*Bulimus purpurascens* BRUG., Encycl. Méth. i, p. 360 (1792).—*Helix purpurea* FER. and of RANG, Ann. Sci. Nat. xxiv, p. 27 (1831).—*Achatina purpurea* LAM., An. s. Vert. iv, p. 128.—POT. et MICH. Galerie i, p. 130, pl. 12, f. 3, 4.—Reeve, Conch. Icon. v, pl. 4, f. 15 b.—KUSTER, Conchyl. Cab. p. 292, pl. 2, f. 6, 7.—PFR. Monogr. ii, 253; iii, 483; iv, 601; vi, 213.—SCHEPMAN, Notes Leyden Museum x, p. 247 (1888).

A well known species, remarkable for the deep color of the interior and columella. The lip is not noticeably expanded.

According to Rang, this is an extremely abundant species along the Malaguette (Liberian) coast, where it extends for a space of over 120 leagues. It is eaten by the blacks but was not found palatable by Rang. The eggs are yellow and quite large, the uterus containing four or five.

Mr. Ancey proposes to separate a form found around Monrovia, Liberia, from *A. purpurea,* under the new name *A. viridescens.* It is described as smaller than *purpurea,* more granulose, the last whorl not so high and especially not so much swollen; the aperture is smaller, the peristome less expanded, margined generally with a band of darker color, the interior more purple, the cuticle constantly of a glaucous green. (Bull. Soc. Malac. France v, p. 69, footnote no. 1. 1888). No figure, dimensions, or further information have been published.

8. A. PORPHYROSTOMA (Shuttleworth).

Shell ovate-oblong, rather solid, striate and closely decussate with spiral lines; olivaceous, marbled with brown streaks and spots. Spire ovate-conoid, obtuse, purple-rose. Whorls 6, a little convex, the last slightly inflated, three-fifths the length; suture with an impressed margination, crenulate. Columella arcuate, purple, the base obliquely truncate. Aperture medium sized, semioval, lilac within. Peristome acute, simple, the margins joined by a very thin, glossy purplish callous, which spreads inwards. Length 60, diam. 32, apert. 32 x 20 mm. (*Shuttl.*).

West coast of Africa (Cuming).

Achatina porphyrostoma SHUTTL., Mittheilungen der naturforschenden Gesellschaft in Bern aus dem Jahre 1852, p. 201. —PFR., Monogr. iii, p. 483.

Described from three similar specimens but not yet figured.

9. A. RHODOSTOMA (Philippi). Pl. 22, fig. 11.

Shell *oblong-conic,* rather thick, striate, whitish under a tawny-buff cuticle, ornamented with close, straight rufous longitudinal streaks; spire conic, a little obtuse; suture little crenulated, hardly margined; whorls 6½, a little convex, the upper ones delicately decussate-granulate, the lower *very smooth,* last whorl longer than the spire. Columella very arcuate, purple, obliquely truncate at the base. Aperture ample, semioval, lilac within, purple near the mouth; peristome acute, the margins joined by a glossy purple callous spreading inward. Length 40, diam. 23 lines (*Phil.*).

West Africa.

Achatina rhodostoma PHIL., Abbild. iii, p. 29, pl. 2, f. 2 (April, 1849).—PFR., Conchyl. Cab. p. 293, pl. 23, f. 3; Monogr. iii, 484; iv, 601; vi, 213.—? *A. purpurea* DESH. in Fér., Hist. pl. 123, f. 1, 2.

According to Philippi, in *A. purpurea* the suture is conspicuously margined while a margin is hardly indicated in *A. rhodostoma.* The surface of *purpurea* is distinctly and strongly granulose, even on the last whorl, not at all obsoletely decussate. His figure is copied on pl. 22, fig. 11. A number of specimens before me differ from *purpurea* chiefly in the almost smooth, not decussate, last whorls, the crowded streaks, often coalescent, and the paler color of the mouth, which is rose rather than purple, and paler or lilac in the throat. The lip is not expanded, nor is it dark-bordered, as in *purpurea.* A specimen measures: length 88, diam. 51, length of aperture 51 mm.

9a. Var. SPLENDIDA Pilsbry, n. v. Pl. 22, fig. 12.

Acute ovate, *thick and heavy.* Whorls 6½, the last two with a distinct sutural margin. Surface minutely, somewhat obsoletely granulose even on the last whorl; irregularly streaked with brown on a lighter ground, under a thin yellow cuticle, the spire marbled with white and angularly streaked with brown. *Aperture bright pink inside,* with a band of deeper salmon-pink near the edge, which is *bordered with white.* Columella similarly colored. The outer and basal margins of the lip are expanded. Length 117, diam. 70, length of aperture 70 mm.

West Africa (coll. A. N. S. P.).

Achatina purpurea REEVE, Conch. Syst. ii, p. 85, pl. 176, f. 1.

This form was well figured by Reeve many years ago, but it seems to have been ignored by Pfeiffer, who referred Reeve's figure to *A. purpurea.*

Group of A. knorri.

Shell *thin* or fragile, not large, usually *boldly marked,* the aperture lilac-white or bluish within, the external markings showing through. Liberia to Kamerun.

10. A. SIDERATA (Reeve). Pl. 25, fig. 24.

Shell ovate, *thin,* olivaceous-yellow, profusely zigzag-streaked and dotted with chestnut. Surface densely, finely and distinctly granulose, the granulation becoming obsolete below the periphery, where it is more glossy. Whorls 5, convex, the apex large and obtuse. Aperture long-ovate, wide and effuse below, acuminate above; interior lilac-tinted with a pearly luster. Columella short, straightened, with a thin narrow callous colored like the mouth.

Length 55, diam. 32 mm. (Reeve's figure).

Length 48, diam. 27, length aperture 30.5 mm.

West Africa: Cape Palmas, Liberia, (Coll. A. N. S. P.).

Achatina siderata REEVE, Conch. Icon. v, pl. 12, f. 38 (March, 1849).—PFR., Monogr. iii, p. 486.—ANCEY, J. de C. 1902, p. 280 (Cape Palmas).

Somewhat related to *A. knorrii* and *papyracea,* but more delicate, and with a different color-pattern.

11. A. PAPYRACEA (Pfeiffer). Pl. 44, fig. 1; pl. 23, figs. 17, 18.

Shell ovate-oblong, thin, obsoletely decussate with longitudinal and concentric striæ, diaphanous, fulvous, obsoletely marbled with chestnut. Spire conic, the apex obtuse; suture margined. Whorls 5½, slightly convex, the last scarcely longer than the spire. Columella nearly straight, reaching nearly to the base of the aperture, obliquely truncate, ornamented with a purple line. Aperture oval, pearly within. Length 66, diam. 30 mm.; aperture 35 x 19 mm. (*Pfr.*).

West Africa: banks of the Nun river, one of the outlets of the Niger (Cuming coll.).

Achatina papyracea PFR., Proc. Zool. Soc. 1845, p. 74; Monogr. ii, p, 254; and ? Conchyl. Cab. pl. 28, f. 8, 9.—REEVE, Conch. Icon. v, pl. 2, f. 6.

Fig. 1 of pl. 44 represents what I take to be the type specimen, after Reeve; agreeing with Pfeiffer's original measurements. Figs. 17, 18 on pl. 23 are a smaller individual subsequently figured by Pfeiffer, which differs from the other in markings and the red columella. The species is known only by the works of Pfeiffer and Reeve.

11a. Var. ADELINÆ Pilsbry, n. v. Pl. 20, figs. 4, 5.

The shell is shaped like *papyracea,* much more slender than *knorrii.* Early whorls roseate, the last two pale yellowish-green, sparsely ornamented with deep chestnut flames, *very few of them reaching the suture* above, widening downwards. *No subsutural tessellation.* Surface smooth and glossy, very weakly decussate. Aperture less than .6 the shell's length, the columella short, narrow, *quite concave* and *crimson.* Length 68, diam. 35, aperture 37 mm.

West Africa (coll. A. N. S. P.).

12. A. BAYOLI (Morelet). Pl. 22, figs. 9, 10.

Shell oblong-ovate, somewhat ventricose, rather solid, closely striate and on the upper surface it is cut into oblong granules by more spaced spiral striæ, absent below the periphery of the last whorl; glossy, tawny-yellow, irregularly marked with vivid dark brown streaks, flammules and dots, widely spaced. Columella slightly arcuate, obliquely truncate, of a bright purple color. Whorls 6½, convex, the last very obsoletely angular in the middle, longer than the spire. Spire conoid, obtuse, the nucleus livid, smooth. Aperture oval, pale lilac within, opaline, and showing the flammules through. Peristome acute, thin. Length 66, diam. 30, aperture 36 x 20 mm. (*Morel.*).

West Africa: Assinie (coll. de l'Ecole des Mines).

Achatina bayoli MOREL., Journ. de Conchyl. 1888, p. 97, pl. 1, f. 4.

Related to *A. papyracea, siderata, knorrii* etc., especially to *papyracea*; and like them, from the northern shore of the Gulf of Guinea.

13. A. KNORRII (Jonas). Pl. 20, figs. 1, 2, 3.

Shell ovate, ventricose, decussate. Deeper rose-colored above, becoming whitish below, under a greenish yellow cuticle, elegantly ornamented with longitudinal brown flames, which widen downwards and become confluent at the base, where they are blackish. Whorls 6, convex, the lower two girt with an impressed line below the suture, last whorl longer than the spire; spire conic, obtuse. Aperture oblong-ovate, white within, the lip edged with a brown border; columella arcuate, callous, glossy and white. Length 2 inches 11 lines, width 1 in. 8 lines, apert. 1 in. 10 lines (*Jonas*).

West Africa: Liberia (Schepman); Kamerun at Etome (Dusen) and Bonge (Sjostedt).

Breitwelligte duenne Kinkhorn, KNORR, Vergnuegen etc., iii, p. 11, pl. 3, f. 1.—*Achatina knorrii* JONAS, Archiv f. Naturg. 1839, i, p. 345.—PFR., Monogr. ii, 250; iii, 485; iv, 601; vi, 214; Conchyl. Cab. p. 365, pl. 47, f. 11, 12.—SCHEPMAN, Notes Leyden Mus. x, 1888, p. 247.—d'AILLY, Bihang etc. p. 63 (1897).—DOHRN, Jahrb. d. D. Mal. Ges. v, 156.—*Achatina prunum* REEVE, Conch. Icon. v, pl. 4, f. 13 (Feb., 1849).

The original description is given above. It is a much smaller, thinner and more delicate shell than *A. marginata,* the thin lip is unexpanded, and the surface of the last whorl is but weakly decussate.

The typical form is obese, with the last 1½ whorls yellow or greenish-yellow, with wide purple-brown zigzag and straight stripes, broader and often coalescent below, most or all of them reaching to the suture above, where most of them split. *The suture has a tessellated border* on the last two or three whorls. The whole spire is commonly dull rose colored, but rarely pale. The aperture takes in .6 or more of the total length of the shell. The columella is white or lead-whitish. A well-grown shell measures, length 72, diam. 39, aperture 43.5 mm.

14. A. CAMERUNENSIS (d'Ailly). Pl. 23, figs. 13-16.

Shell oblong-ovate, thin, with a silky luster, *everywhere decussate, closely and distinctly granulate,* the granules sometimes weaker, though still distinct, below the periphery.

Olive-buff, ornamented with chestnut-brown longitudinal, rarely zigzag streaks, sometimes broken into spots, wider below the periphery of the last whorl, and generally confluent at the base. Spire conic, the apex obtuse, pale rose; suture obsoletely margined and subcrenulate. Whorls 6, the upper ones but little convex, the last swollen, more than three-fifths the total length. Columella narrow, above obsoletely twisted-plicate, bluish below bordered by a white callous, obliquely and shortly truncate, not reaching to the base of the aperture. Aperture little oblique, oblong acuminate-oval, bluish-white inside, with a pearly luster, showing the external stripes through. Peristome simple, acute, frequently a trifle expanded, brown-edged within, the margins joined by a very thin callous, the right margin arcuately produced below the middle. Length 80 to 90, diam. 40 to 50; aperture, length 47 to 53, width below the middle 25 to 28 mm. (*d'Ailly*).

West Africa: Etome, Kamerun, 230 meters elev. (Dusen).

Achatina camerunensis D'AILLY, Mollusques terrestres et d'eau douce de Kamerun, in Bihang till K. Sv. Vet. Akad. Handl., xxii, p. 64, pl. 3, f. 1-4 (1896).

The distinctive feature of this species is its granulation, distinct even below the periphery. The flames frequently are abruptly interrupted at the periphery, only some narrow branches extending upwards. The suture is margined and finely crenulate.

Genus COLUMNA Perry, 1811.

Columna PERRY, Conchology, pl. 51.

The shell is imperforate, oblong-tapering or pillar-shaped; the protoconch is large, first whorl planorboid, nearly smooth, those following descend rapidly, are flatly sloping and densely granose-decussate. The subsequent (post-embryonic) whorls are convex, either smooth or decussate, and are zigzag-streaked. The outer lip is thin and simple, the columellar axis is imperforate, slender, more or less spirally coiled in the later whorls, and narrowly truncate at base.

The back has three keels, set with black tubercles. Posteriorly the foot is flattened above (pl. 44, fig. 7, *C. columna*, after Rang). Egg capsules oblong and a little *arcuate*, light yellow, three or four being found in the uterus (pl. 44, fig. 6, *C. columna*, after Rang). Internal anatomy unknown.

Type *C. columna* Müll. Distribution, islands in the Gulf of Guinea. Prince Island is the only well attested locality for *Columna;* but on more or less doubtful authority, Cape Palmas and Grand Bassam, mainland points, have been given. They live on the ground, under leaves and fallen wood, in moist valleys in the mountains.

Columna is closely related to *Archachatina*, from which it is differentiated chiefly by the lengthening and looser coil of the whole visceral mass and shell, while meantime the coloration and system of sculpture remain unchanged. *Archachatina* is the acme of its phylum, while *Columna* is a lateral branch with phylogerontic characteristics. Insular stocks often hasten to complete their cycles, perhaps owing to the stereotyped environments. Most island faunas of any antiquity show an undue proportion of senile types.

Key to Species.

1. Columella projecting in a callous flange above, spirally ascending, the axis seen to be hollow in a basal view; surface of shell strongly decussate-granose. *C. columna*, no. 1.
2. Columella appressed above, not projecting; no axial hole seen in a basal view. Surface smooth or nearly so.
    - *a.* Shell elongate, the surface very minutely, subobsoletely decussate. *C. leai*, no. 2.
    - *b.* Shell shorter, the last whorl more gibbous, the surface smooth. *C. hainesi*, no. 3.

1. C. COLUMNA (Müller). Pl. 46, figs. 5-9.

Sinistral, pillar-shaped, moderately solid; yellow or dirty yellowish-white, profusely marked with red-brown stripes, which on the upper part of each whorl are weak, split and interrupted or obsolete; the apical whorls being dull and red-brown. Surface is closely granulose throughout by the decussation of fine oblique wrinkles by incised spiral lines. Whorls 7 to 8½, those of the protoconch flattened, the following convex, with more or less deeply constricting and very oblique sutures, the last whorl or two more or less compressed in the middle. Aperture ovate, oblique, white inside. Columella deeply concave, with a callous fold above and a narrow truncation below. Internal column (fig. 8) slender and imperforate, at first nearly straight, then strongly spiral, with a projecting callous flange in the last whorl.

Length 96, diam. 18 mm., whorls 8½.

Length 77, diam. 17 mm., whorls 7¼.

Prince Island: very abundant in the intermediate zone of the mountains (Rang); very common under dead leaves in the woods (de Folin).

Buccinum columna Mull., Hist. Vermium, ii, p. 151 (1777).—*Helix columna* Gmel., Syst. Nat. (13), p. 3653.—Rang, Ann. Sci. Nat., xxiv, p. 34, pl. 1, f. 1 (living animal).—*Bulimus columna* Brug., Encycl. Méth., i, p. 332.—*Achatina columna* Voigt in Cuvier, Thierreich, iii, p. 99.—Pfr., Monogr., ii, p. 268; Conchyl. Cab., p. 302.—Reeve, Conch. Icon., v, pl. 11, f. 38.—Desh. in Fér., Hist., ii, p. 168, pl. 123, f. 9, 10.—*Limax flammeus* Martyn, Univ. Conch., iii, pl. 122; edit. Chenu, Bibl. Conch., ii, p. 28, pl. 41, f. 1.—*Columna flammea* Schumacher, Essai d'un Nouv. Syst., p. 188.—Pfr., Monogr., iii, 468; iv, 570; vi, 188; viii, 252.—Girard, Jornal de Sciencias Math. Phys. e Nat. Acad. Real das Sciencias de Lisboa (2 ser.), iii, 1893, p. 95.—Dohrn, Malak. Bl., xiii, p. 124 (living animal, eggs, etc.).—*Helix pyrum* Gmel., Syst. Nat. (13), p. 3665.—*Columna grisea* and *C. marmorea* Perry, Conchology, pl. 51, figs. 6, 7 (1811).—*Lymnea columnaris* Lam., An. s. Vert., vi, p. 159; Encycl. Méth., pl. 459, f. 5.—Reeve, Conch. Syst., ii, pl. 178, f. 14.—Kuester, Conch. Cab., pl. 10, f. 10-13.—*Helix listeri* Bolten, Mus. Bolt., p. 108.—*Columna virgata* Gray, Figs. Moll. Anim., pl. 302, f. 1.

This remarkable species has been known for many years. It ordinarily reaches the length of 75 to 80 mm., and probably never exceeds 100 mm. long. The degree of development of the callous flange upon the columella varies a good deal in apparently mature specimens. The early whorls are always more or less worn in adult shells. In the young they are seen to be densely decussate-granose, exactly as in Archachatina, the initial whorl only being smoothish. Three and a half whorls are dark reddish-brown; then light stripes appear, and after another half whorl the adult coloration sets in, the sculpture at the same time becoming rougher. The broad spiral trend of the columella causes an axial hollow or "false-umbilicus," which may be seen as a round hole in a basal view of the shell.

2. C. LEAI Tryon. Pl. 46, figs. 12, 13.

"Shell elongate-fusiform, sinistral, smooth, somewhat thick; whorls 6, obliquely revolving, increasing gradually and somewhat convex, but broadly flattened on the periphery, which in the last whorl is somewhat impressed; apex obtuse; suture crenate margined, not deep; aperture small, narrow-ovate, the labrum with a slight revolving white callous. Yellowish with oblique zigzag longitudinal brown stripes. Length 66, diam. 19 mill.; length of aperture 23, width 19 mill." (*Tryon*).

Prince Island (Dr. J. Wilson, U. S. N.).

Columna leai TRYON, Amer. Journ. Conch., ii, p. 297, pl. 20, f. 1.—PFR., Monogr., viii, p. 252.

Tryon's original description and figure are given. The specimens before me (fig. 12) are very similar to *C. hainesi* Pfr., with which they agree in coloration; but they differ in sculpture. Under the lens, *C. leai* is seen to be finely, regularly plicatulate, and decussated by close spirals, similar to *C. columna* but very much weaker, so superficial in fact that the surface at first glance looks as smooth as *C. hainesi*. The difference in size, emphasized in the original description, is of small importance, and it is likely that *C. hainesi* and *leai* will be found to intergrade. Specimens of *leai* measure:

Length 48, diam. 15.5, aperture 18 mm.; whorls 6¾.
Length 42, diam. 15, aperture 19.5 mm.; whorls 6½.

3. C. HAINESI Pfeiffer. Pl. 46, figs. 10, 11.

Shell sinistral, oblong-turrite, rather solid; smooth, rather glossy; corneous-fulvous, painted with dark chestnut bent and angulated streaks. Spire long-conic, the apex obtuse. The suture has a broad impressed border. Whorls 5½, the upper ones flat, the last two rather swollen, subcarinate below the middle, the last whorl about one-third the total length. Columella obliquely truncate, with a thin callous above. Aperture oblique, semioval, bluish inside; peristome simple, unexpanded.

Length 44, diam. 17 mm.; aperture 16 mm. long, 8 wide (*Pfr.*).

West Africa: Cape Palmas (Haines coll.); Prince Island (J. Wilson); Grand Bassam (C. de Paiva).

Columna hainesi PFR., Malak. Bl., iii, 1856, p. 256; Monogr., iv, 571; vi, 188; viii, 252.—TRYON, Amer. Journ. of Conch., ii, p. 297, pl. 20, f. 2.—GIRARD, Jornal Sci. Math., Phys. e Nat., Lisboa, iii, 1893, p. 110.

The figures represent specimens in coll. A. N. S. P. The protoconch in these shells is exactly like that of *C. columna* in shape, of the same dark reddish-brown color, which gives place to oblique stripes and then, at or near the end of the fourth whorl, to the adult color-pattern of irregular, oblique stripes on a yellow ground, the stripes slender or forked at the upper fourth of the last whorl, hence narrow and numerous on the subsutural region. The surface is smooth, except for some faint ripples along growth lines, and a few spirals run along the subsutural depression. There is no callous flange upon the columella, which is less sinuous within than in *C. columna*. No "false-umbilicus" can be seen in a basal view. The columella is very narrow, and varies a good deal in curvature.

Length 40, diam. 16, length of aperture 15 mm.

Length 37, diam 14.5, length of aperture 15 mm.; whorls 6½.

These shells are labelled "Prince I." and "Cape Palmas." The type was from the Haines collection, New York City.

Species of other genera described as Columna.

Columna bulimea Spix = *Thaumastus* Man. Conch., x, p. 55 (*Bulimulidæ*).

Columna ramentosa J. G. Cooper = *Plicolumna* in *Bulimulidæ*, Man. Conch., xi, p. 153.

Columna californica auct. = *Rhodea.*

Columna aciculoides Crist. & Jan., Catalogus, Mantissa, p. 2 = *Cecilioides.*

Columna miliaris C. & J., *l. c.* = *Cecilioides.*

Columna clavula Villa = *Opeas.*

Columna dentiens Villa = *Azeca.*

Columna eximia Shuttl., Pfr. = *Clavator.*

Columna teres Meek & Hayden, Report of the U. S. Geol. Survey of the Territories, ix, 1876, p. 555, pl. 44, f. 11.

Columna vermicula M. & H., *t. c.*, p. 556, pl. 44, f. 12, with var. *contraria* Meek, p. 557. This form and the preceding, from the Laramie of the Upper Missouri, Fort Union Group, are much smaller than the recent Columnas, with more numerous whorls; they have the apex small and acute, and therefore cannot belong to *Columna* as that genus is now restricted. There is absolutely no reason to believe them at all related to this African genus.

Genus CALLISTOPLEPA Ancey, 1888.

Callistoplepa Ancey, Bull. Soc. Malac. France, v, 1888, p. 69, foot-note no. 2, type *A. shuttleworthiana* Pfr. *Ganomidos* d'Ailly, Moll. terr. et d'eau douce de Kameroun, p. 68 (1896).—*Callistopepla* Ancey, Nautilus, xii, p. 92, type *A. shuttleworthi* (Dec., 1898).

Shell ovate-conic, *very thin*, subdiaphanous, slightly glossy, corneous, with a varnish-like luster, ornamented with reddish stripes, zigzag or angularly bent forward at the suture and periphery, and usually minutely speckled with white. Spire conic, the apex mamillate, obtuse. Whorls about 6, a little convex, the nucleus smooth, the rest *very closely ribplicate* and finely striate spirally; the embryonic whorl separated by a channelled, plicate suture, the rest with an impressed suture. Last whorl inflated, tapering below, longer than the spire. Columella slightly inturned, straight or moderately arcuate, obliquely truncate.

The foot is long and tapering, with a triangular flattening above with serrate-crested margins. Mantle streaked and maculate with black and brown, showing through the shell.

The radula has nearly straight transverse rows, the *central teeth are about as large as the laterals;* centrals and laterals unicuspid, marginal teeth with small ento- and ectocones developed.

Eggs elliptical, small, oval, with a chalky-white granulate calcareous shell.

Type *Achatina shuttleworthi* Pfr. Distribution, West Africa: Grand Bassam to Kamerun, and in the Congo Valley.

The summit of the shell is rather mamillate, the nucleus smooth, following embryonic whorls with the sculpture of the rest of the shell. The paper-like tenuity of the shell, its peculiar gelatinous luster, the thread-like vertical sculpture and the system of coloration, all separate this group from *Achatina.* The narrow foot is a further distinguishing character, but the radula shows a much greater differentiation: the *central tooth is wide,* as in *Helicidæ,* in striking contrast to almost the entire series of Achatinoid genera, in which as a rule it is very much reduced in size.

The eggs are white, not yellow as in *Achatina* and its near relatives. An individual of *C. barriana* opened by d'Ailly contained 14 eggs measuring 6½ to 7 mm.

This genus was proposed by Ancey in 1888 with only a brief definition. It was independently recognized and placed upon a firm basis, in 1896, by Adolf d'Ailly, to whom we owe our knowledge of its generic characters.

The name *Callistopepla,* "most beautiful garment," was misspelled in Ancey's original note, *Callistoplepa;* but unfortunately another name was proposed before it appeared in the amended form. It is impossible to truthfully quote *Callistopepla* earlier than 1898; and I am therefore compelled to adopt the name as originally spelled. An author who proposes new genera in foot-notes, misspells the names both of his new genus and of its type, and gives only the scantiest of descriptions, cannot expect to appear to the best advantage in subsequent works.

1. C. SHUTTLEWORTHI Pfeiffer. Pl. 47, figs. 18, 19, 20.

Shell ovate-conic, *very thin*, submembranaceous, very closely chordate-plicate, silky, corneous, banded with rufous spots at the suture and periphery, the rest of the surface streaked with pale rufous. Spire conic, obtuse. Whorls 5½, a little convex, the last a little longer than the spire. Columella rather narrow, compressed, obliquely truncate at the base. Aperture oblique, truncate-oval; peristome simple, thin. Length 34, diam. 17, aperture 19 x 11.5 mm. (*Pfr.*).

Length 27, diam. 14.5 mm. (d'Ailly).

West Africa: Grand Bassam (Verreaux); Kamerun at Bonge and N'dian (Sjostedt).

Achatina shuttleworthi PFR., P. Z. S., 1856, p. 34; Monogr., iv, p. 603.—*Ganomidos shuttleworthi* (Pfr.) D'AILLY, Moll. terr. et d'eau douce de Kameroun, Bihang, etc., xxii, 1897, p. 69, pl. 3, f. 11-14.

D'Ailly remarks that the diagnosis given by Pfeiffer does not mention the spots of pale whitish-yellow which give the shell a beautiful appearance. They have an enamelled, opaque appearance, and occur almost exclusively at the apices of the arrow-shaped spots of the characteristic peripheral and subsutural girdles. They are produced by the transformation of the substance of the fine riblets, while the spaces between these riblets retain the general color of the shell. The surface is often corroded on these spots. The axial sculpture is very strongly developed and regular, while the spiral striæ are extremely fine.

2. C. BARRIANA (Sowerby). Pl. 47, figs. 14, 15, 16, 17.

Shell ovate-conic, thin, corneous, banded with small brown spots at the suture and periphery, and sprinkled here and there with small whitish spots. Spire conic, the apex obtuse. Whorls 6, a little convex, the upper ones smooth, the rest very densely lirate, liræ rugose; last whorl longer than the spire, inflated. Aperture ample, slightly oblique; peristome simple, thin; columella lightly inflexed, obliquely truncate. Length 43, diam. 23, length of aperture 24, diam. 14 mm. (*Sowb.*).

A light shell of elegant form, sculptured with very fine, close, corrugated ridges. The body-whorl is sprinkled with small, white, flake-like spots (*Sowb.*).

Length 59, diam. 33 mm. (d'Ailly).

Calabar? (Sowb.). Kamerun: Bonge (Dusen, Sjosted), Itoki, Kitta (Sjosted), Bibundi (Jungner), Barombi (Preuss).

Achatina barriana Sowb., P. Z. S. Lond., 1889, p. 579, pl. 56, f. 2.—v. Martens, Sitzungsber. Ges. naturf. Freunde Berlin, 1891, p. 30.—*Ganomidos barrianum* (Sowb.) d'Ailly, Bihang, etc., p. 69 (dentition), 70, pl. 3, f. 5-9.

The spiral striation is especially well developed in this species, while the oblique axial sculpture is not so strong or regular as in the preceding. The pattern of coloring is the same as in *C. shuttleworthi*, but less distinct; the whitish spots are very small and scattered all over the surface, but of the same nature as those of *C. shuttleworthi*. Mr. Sowerby's type was not full-grown. The above notes and the figures are from d'Ailly.

3. C. pellucida (Putzeys). Pl. 43, figs. 3, 4.

Shell imperforate, ovate, of papery consistence, corneous, hardly glossy. Spire conic, a little contracted at the end, the apex obtuse. Whorls 6, a little convex, painted with brown wavy flames, sometimes zigzag; the first 5 whorls regularly granulate, the last whorl inflated, roughened by growth-wrinkles, decussate down to the periphery. Aperture oval, the lip acute; columella arcuate, margins joined by a very thin callous. Length 40-45, diam. 21-26, length of aperture 23-28 mm. (*Putzeys*).

Congo Free State: forest of Piani Kapuri, in the zone of Manyéma.

Ganomidos pellucidus Putz., Ann. Soc. Roy. Malac. de Belgique, xxxiii, 1898, p. lxxxiv, f. 20, 21 (Dec. 15, 1899).

Not unlike *C. barriana*, but no white dots are mentioned, and there seem to be no spot-girdles at suture and periphery.

4. C. FRATERCULUS (Dupuis et Putzeys). Pl. 47, fig. 23.

Shell thin, fragile, corneous, imperforate, globose-turrite, the apex obtuse; hardly shining; deep brownish-olive, indistinctly painted with red-brown spots and streaks, somewhat flame-like, and yellow-bordered on one side. Whorls 5½ to 6, a little convex, the embryonic smooth, following whorls longitudinally rudely striate; the last whorl indistinctly subangulate, wrinkled like the preceding, and sometimes encircled with more or less regularly placed liræ all over. Aperture oval, the lip acute, bluish within; columella brown, sometimes whitish within, twisted, arcuate, and obliquely truncate. Length 47, diam. 27, length of aperture 27 mm. (*D. & P.*).

Congo Free State: Island of Moula, on the Lualaba (P. Dupuis).

Ganomidos fraterculus D. et P., Ann. Soc. Roy. Mal. Belg., xxxv, 1900, Bull. des Séances, p. xiii, f. 18 (June 15, 1901).

5. C. MARTELI (Dautzenberg). Pl. 47, figs. 21, 22.

Shell thin and fragile, subpellucid, ovate-elongate. Spire conoid, the apex obtuse. Whorls 6, a little convex, separated by an impressed suture, the first very delicately punctate, the rest decussated with strong oblique growth-plicæ cut by transverse striæ. Transverse striæ close below the suture, more remote towards the lower part of the whorls, and evanescent below the periphery of the last whorl, which is especially glossy below and anteriorly. Aperture piriform, two-thirds the total length. Columella a little arcuate, truncate below. Lip simple, arcuate and acute.

Color yellow, lightning-streaked with brown longitudinal flammules, which are much wider on the last whorl. The aperture is milk-white towards the margin within, but in the throat is subpellucid, showing the external markings through.

Length 64, diam. 32, length of aperture 36, width 22 mm. (*Dautz.*).

Var. *pallescens* Dautz. (pl. 47, fig. 22). Early whorls yellow, wholly destitute of flames; last whorl ornamented with pale, hardly visible flammules (*Dautz.*).

Congo Free State, in the region of Lake Tanganyika (R. P. Guillemé).

Achatina marteli Dautz., Ann. Soc. Roy. Malac. Belgique, xxxvi, 1901, p. 3, pl. 1, f. 1, and var. *pallescens*, f. 2.

The photographic figures, copied on my plate, do not show the color-markings of the shell.

Genus HOMORUS Albers, 1850.

Homorus Alb., Die Heliceen 1850, p. 196, sole species *Achatina cyanostoma.* Edit. 2, p. 200, in part.—not *Homorus* Reichenb., Handbuch Spec. Orn. p. 172 (1853). Kobelt, Conchyl. Cab. 1 Bd., 10te Abtheil., p. 87, 1894.

Shell imperforate, rather thin, turrited-conic, the spire usually a little contracted near the summit, which is obtuse and rounded, the embryonic shell being subcylindric, the whorls smooth at the suture (except in the subgenus *Subulona*). Post-embryonic whorls smoothish, typically covered with a colored, brown-streaked cuticle. Aperture Achatinoid, the columella concave, truncate below.

Jaw rather strong, with numerous (21) flat ribs, and covered with strong vertical striæ (pl. 62, figs. 15, 16, *H. cyanostoma,* after Jickeli). Radula has 44.1.44 teeth; centrals narrow, with a blunt, trilobate cusp without noticeably reflexed points. Lateral teeth large, with the mesocone acute, ento- and ecto-cones well developed (pl. 62, fig. 17, *H. cyanostoma,* after Jickeli).

Type *H. cyanostoma.* Distribution, tropical Africa.

Homorus differs from *Achatina* by the small size and simple coloration of the long-spired shell; but more fundamentally by its obtuse, rounded or bulbous apex, and shortly cylindric embryonic shell. *Pseudoglessula* is closely related, and has been ranked as a subgenus of *Homorus* by Kobelt; but it has some special characters which it may be best to signalize by generic rank. *Homorus* differs radically from *Trichodina* in the form of the early whorls.

There is at present no definite division between *Homorus* and *Subulina.* A large series of African species have been arbitrarily placed in one or the other genus; and the data necessary for the classification of these forms remain still to be investigated.

Homorus pfeifferi of Kobelt's monograph, p. 90, is an *Achatina;* see p. 24 of this volume.

The species are arranged thus:

- Abyssinian species
  - Typical group, species 1, 2.
  - Group of H. darnaudi, species 3 to 10.
- Subgenus Subulona Martens
  - Species of the Lake region and East Africa, 11 to 20.
  - West African species, 21 to 34.

Abyssinian Species.

(Typical Group.)

1. H. CYANCSTOMA ('Rüppell' Pfr.). Pl. 58, figs. 40, 41, 42.

Shell turrited, the apex obtuse; buff variegated with longitudinal brown streaks. Whorls 9 to 10, rather flat, the last slightly exceeding one-third the length of the shell. Columella arcuate, obliquely truncate. Aperture oblong-oval, milk-white inside; peristome simple, blue-margined. Length 48, diam. 15 mm.; aperture 18 mm. long, 8.5 wide in the middle (*Pfr.*).

Northeast Africa: Abyssinia (Rüppel).

Achatina cyanostoma Rüppell Mss., PFR., Symbolæ ii, p. 58; Conch. Cab. p. 336, pl. 29, f. 8, 9; Monogr. ii, p. 259; iii, 498; iv, 608; vi, 228; viii. 282.—REEVE, C. Icon. v, pl. 13, f. 44.—MARTENS, Malak. Bl. 1865, p. 182, 200; 1866, p. 95.—MORELET, Voy. Welwitsch, p. 40.—*Homorus c.,* ALBERS, Die Hel. 1850, p. 196; edit. 2, p. 200.—KOBELT, C. Cab. p. 88, pl. 24, f. 1.—POLLONERA, Bull. Soc. Mal. Ital., xiii, 1888, p. 73.—*Subulina cyanostoma* BECK, Index p. 76.—JICKELI, Moll. Nord-Ost-Afr. p. 147, pl. 2, f. 7 (dentition).—BGT., Malac. Abyss. p. 120.—*Glandina cyanostoma* PHILIPPI, Abbild. i, p. 134, pl. 1, f. 4.

The apex is rather large, rounded, the first whorl a trifle sunken at the tip, rapidly increasing, the next whorl or two scarcely increasing, forming a somewhat cylindric summit, and giving the upper part of the spire an attenuated appearance. The chestnut-brown streaks begin on the fifth whorl.

2. H. RAGAZZII Pollonera. Pl. 58, fig. 51.

Shell imperforate, turrited-subulate, closely and irregularly longitudinally striate, fragile, lucid. Spire pale corneous; last whorl corneous, sparsely marked with brown longitudinal streaks. Whorls 8, a little convex, the last nearly one-half the total length. Aperture piriform, acutely angular above; columella arcuate, suboblique and shortly truncate; outer lip straight, acute. Length 16.5, diam. 5.5 mm. (*Poll.*).

Northeast Africa: Entoto, Havash Valley, Abyssinia, a single specimen under a stone (Dr. Ragazzi).

Homorus ragazzii POLL., Bull. Soc. Malac. Ital. xiii, 1888, p. 74, pl. 3, f. 10 (shell), 16 (teeth).

Differs from *H. cyanostoma* by its much smaller size, relatively less lengthened and less acute spire, and fewer dark stripes, which are restricted to the last whorl.

Group of H. darnaudi.

Pale, glossy corneous or greenish-yellow shells without brown streaks; the surface usually distinctly striate, early whorls smooth.

These forms might as well have been left in *Subulina*, from which they differ chiefly in being larger; but it is not easy to draw a line between them and still larger, opaque, brown-streaked forms, which are not likely to belong to *Subulina*.

3. H. VERNICOSUS (Jickeli). Pl. 58, figs. 43, 44.

Shell imperforate, subulate, thin, longitudinally irregularly striate, decussated with very fine spiral lines at the base of the last whorl, with a varnish-like gloss; uniform greenish-yellow. Spire long, the apex rather obtuse, papillate; whorls 12, a little convex, separated by a rather deep, oblique suture, the last whorl descending, one-third the total length. Aperture oblique, piriform, acutely angular above, dilated basally. Columella arcuate, obliquely truncate; peristome simple, thin, straight, the margins joined by a superficial callous. Length 55, diam. 13, aperture alt. 16, width 6.5 mm. (*Jick.*)

Northeast Africa: between Genda and Asmara, prov. Hamaszen, Abyssinia, under dead leaves in crevices of the rocks.

Stenogyra vernicosa JICK., Malak. Bl. 1873, p. 103.—*Subulina vernicosa* BGT., Malac. Abyss. p. 120.—*Subulina antinorii* Morel., JICKELI, Moll. Nord-Ost-Afr. p. 145, pl. 2, f. 6 (jaw and teeth); pl. 5, f. 29 (shell).

This fine species differs from *H. cyanostoma* in color, and is larger than any of the other species. Jickeli finally united it with *antinorii* Morel., a course considered erroneous by Bourguignat.

4. H. ANTINORII (Morelet). Pl. 58, fig. 50.

Shell imperforate, turrited, thin, smooth, slightly striate, under the lens very finely decussate; glossy, unicolored corneous-fulvous. Spire elongated, the apex rather obtuse, papillate. Whorls 10, a little convex, joined by a deep suture, the last whorl slightly exceeding one-third the total length. Columella lightly arcuate, obliquely truncate, not reaching the base. Aperture oblong, biangular; peristome simple, thin, unexpanded, the margins joined by a superficial callous. Length 31, diam. 9 mm.; aperture 11 mm. long, 4 wide (*Morel.*).

Northeast Africa: Dubur-Chair, a mountain in the Mensas country, between the Bogas and the Sanhar, Abyssinia (*Issel*); Nefasit and Ghinda, Erythræa (Gen. Boccard).

Achatina antinorii MORELET, Annali del Museo Civico de Storia Naturale di Genova, iii, p. 199, pl. 9, f. 9 (1872).—PFR., Monogr. viii, 284.—*Homorus a.*, KOBELT, C. Cab., p. 100.—*Subulina a.*, POLLONERA, Boll. Mus. Zool. ed Anat. Comp. Univ. Torino xiii, no. 313, p. 7.

5. H. DARNAUDI (Pfeiffer). Pl. 58, figs. 52, 53.

Shell turrited, rather thin, nearly smooth, irregularly obliquely striatulate, subdiaphanous, pale corneous; spire elongate, the apex rather obtuse; suture lightly impressed, somewhat margined. Whorls 11 to 12, the upper ones convex, the following rather flat; last whorl slightly more than one-fourth the total length, attenuated below. Columella very arcuate, narrowly truncated at the base of the oblique, sinuate-oval aperture. Peristome simple, the right margin somewhat arched forward. Length 35, diam. 7.33 mm.; aperture 9 mm. long, 4 wide (*Pfr.*).

Northeast Africa: Sennaar (D'Arnaud).

Achatina (*Subulina*) *darnaudi* PFR., Malak. Bl. 1855, p. 169; Novit. Conch. i, p. 81, pl. 22, f. 7, 8; Monogr. iv, p. 611. —*Subulina darnaudi* JICKELI Moll. Nord-Ost-Afrikas, p. 137.—*Homorus darnaudi* KOBELT, Conch. Cab., p. 110.

6. H. VARIABILIS (Jickeli). Pl. 58, figs. 45, 46.

Shell imperforate, subulate, very delicately striated longitudinally, opaque, waxy-corneous. Spire elongated, the apex slightly mamillar; suture oblique, rather deep, sometimes submarginate. Whorls 10, convex, the last descending, one-third the length or more. Aperture suboblique, piriform, acuminate above, widened at the base; columella arcuate, long, obliquely truncate, the lip thin, acute, sometimes covered with cuticle. Length 25.5, diam. 7, height of mouth 7.25, width 4 mm.; penult. whorl 4.5 mm. high, 6 wide (*Jickeli*).

Northeast Africa: plateau of Asmara, Abyssinia, under the bark of fallen candelabra Euphorbias (Jick.); Nefasit, Erythræa (Gen. Boccard).

Stenogyra variabilis JICKELI, Malak. Bl. xx, 1872, p. 105.—*Subulina variabilis* JICKELI, Moll. Nord-Ost-Afr. p. 139, pl. 5, f. 23-25; pl. 2, f. 4 (dentition of var. 3).—*Achatina variabilis* PFR., Monogr. viii, p. 287.—*Homorus* v., KOBELT, Conch. Cab. p. 101.—*Subulina* v., POLLONERA, Boll. Mus. Zool. ed Anat. Comp. Univ. Torino xiii, no. 313, p. 8.

Besides the typical form, Jickeli distinguishes two varieties, which Bourguignat has elevated to species and named as below. Pollonera states that the specimens collected by Gen. Boccard at Nefasit show intergradation between these forms.

Var. *lhotellerii* Bgt. Pl. 58, fig. 47.

This form has only 5 whorls, wider in proportion to length than in *variabilis,* a shorter columella, the outer lip always with a cuticle bending inwards. Length 20, diam. 7, aperture 7.5 mm. high, 4 wide; penult. whorl 4 mm. high, 5.33 wide. Asmara plateau, about 7200 ft. elev.

S. variabilis var. B., JICK. t. c. p. 140, pl. 5, f. 24.—*S. Lhotellerii* BGT., Moll. Egypte, Abyss., etc. p. 10 (1879); Malac. Abyssinie, p. 121.

Var. *jickelii* Bgt. Pl. 58, fig. 48.

This variety has 11 whorls, and is distinguished by its large size, thin shell of a greenish color, larger embryonic whorl and higher last volution. Length 30, diam. 7, height of aperture 7.25, width 4 mm.; penult. whorl 5 mm. high, 6 wide. Collected on the way from Genda to Asmara (*Jick.*).

Jickeli has described and figured the jaw and teeth of this form.

S. v. var. C., JICK., t. c. p. 140, pl. 5, f. 25; pl. 2, f. 4 (dentition).—*Subulina jickelii* BGT., Moll. Egypte, Abyss. etc., p. 10 (1879); Malac. Abyss., p. 121.

7. H. ANGUSTATUS (Jickeli). Pl. 58, figs. 54, 55.

Shell imperforate, subulate, longitudinally striate under the lens, vernicose, waxy greenish (?). Spire elongate, the apex a little obtuse; suture suboblique, rather deep, seen to be submarginate under a lens. Whorls 10⅓, somewhat convex, the last descending, more than one-fourth the total length. Aperture oval, acutely angular above, widened and receding at the base. Columella rather deeply arcuate, subobliquely truncate; lip curved, thin, acute. Length 24, diam. 5.75, alt. apert. 5.5, width 3 mm.; penult. whorl 3.75 mm. high, 3 wide (*Jick.*).

Northeast Africa: Ravine of Asqaq, near Nakfa, in the Habab range, Abyssinia.

Stenogyra angustata JICK., Malak. Bl. 1873, p. 104; Reisebericht p. 60.—*Subulina angustata* JICK., Moll. Nord-Ost-

Afrika's, p. 143, pl. 5, f. 27.—*Homorus a.,* KOBELT, C. Cab. p. 102.

Differs from a variety of *Subulina dunkeri* which agrees in general appearance, by the greater number of whorls in a less length, the varnish-like gloss and more acute apex. It is smaller than *subulata,* with about the same number of whorls and a shorter mouth (*Jickeli*).

8. H. SUBULATUS (Jickeli). Pl. 58, figs. 58, 59.

Shell imperforate, subulate, rather solid, thin, longitudinally subcostulate-striate, the last whorl, under a lens, lightly wrinkled spirally; pale greenish; suture somewhat oblique, submarginate. Whorls 11, subplanulate, the last one-fourth the length, descending, the base tapering. Aperture very oblique, narrowly oval, acutely angular above, the base slightly receding. Columella subarcuate, obliquely and rather shortly truncate; outer lip somewhat arching forward above; basal margin narrow. Length 27, diam. 6.5, alt. aperture 7.5, width 3 mm.; penult. whorl 4 mm. high, 6 wide (*Jick.*).

Northeastern Africa: On the road from Genda to Asmara, and near Mekerka, on the Toquor, prov. Hamaszen, Abyssinia, under the bark of logs.

Stenogyra subulata JICKELI, Mal. Blatt. 1873, p. 104.—*Subulina subulata* JICKELI, Moll. Nord-Ost-Afr. p. 141, pl. 2, f. 5 (dentition); pl. 5, f. 26 (shell).—BGT., Malac. Abyss. p. 121.—*Achatina subulata* PFR., Monogr. viii, p. 291.—*Homorus s.,* KOBELT, C. Cab. p. 102.

This species is narrower than the typical form of *variabilis* Jick., and differs from the third variety, *C.,* by its spiral wrinkles, narrower mouth, less convex whorls and thicker shell.

9. H. SUAVEOLANS (Jickeli). Pl. 58, figs. 56, 57.

Shell imperforate, subulate, under a lens seen to be longitudinally very finely striate, very glossy, hyaline, waxen. Spire turrited, the apex rather obtuse; suture deep, somewhat margined. Whorls 9, swollen, the last scarcely equaling one-third the total length, very slightly angular at the periphery.

Aperture piriform, acutely angular above; columella slightly arcuate, horizontally and shortly truncate; outer lip unexpanded, acute. Length 21, diam. 7, alt. aperture 7.5, width 4 mm.; penult. whorl 3.75 mm. high, 4 wide (*Jick.*).

Northeast Africa: Between Genda and Asmara, prov. Hamaszen, Abyssinia, under bark of a dead candelabra Euphorbia.

Stenogyra suaveolans JICK., Malak. Bl. 1873, p. 104; Reisebericht p. 38.—*Subulina suaveolans* JICK., Moll. Nord-Ost-Afr. p. 144, pl. 5, f. 28.—BGT., Malak. Abyss. pp. 82, 121.—*Achatina s.*, PFR., Monogr. viii, p. 291.—*Homorus s.*, KOBELT, C. Cab. p. 103.

The animal is fragrant. Jickeli placed the single specimen found, which was closed with a strong, thin, chalky, flat epiphragm, in alcohol. When the epiphragm was broken an agreeable odor, recalling oil of roses, poured out. As the specimen was preserved in the same alcohol with other Subulinas, the fragrance must have proceeded from the animal itself, and not from the alcohol. Examples of ill-smelling land snails are already known (see Martens, Nachrichtsblatt Deutsch. Mal. Ges. 1871, p. 201).

10. H. PERRIERIANUS (Bourguignat). Pl. 58, fig. 49.

Shell imperforate, elongate-subulate, rather solid, somewhat opaque, slightly shining, somewhat greenish corneous; quite strongly striatulate except the first three whorls which are paler and smooth. Spire long, subacuminate, obtuse at the summit; apex obtuse, the embryonic whorl very minute. Whorls 9, rather convex, slowly increasing, separated by an impressed suture; last whorl moderately rounded, one-fourth the total length, a little descending in front. Aperture oblique, subovate-rounded, milky within; peristome unexpanded, acute, black-edged; the terminations joined by a glossy callous. Columella short, robust, strongly arcuate and abruptly truncate at the base. Length 26, diam. 7, alt. aperture 6.5 mm. (*Bgt.*)

Northeast Africa: High plateau of Anderta, Abyssinia (Raffray).

Subulina perrieriana BGT., Malacologie de l'Abyssinie, p. 81, pl. 9, f. 64, (1883).

Notable for the swollen whorls, glossy, well striated shell, small rounded aperture with the columella very much arched and the lip bordered with black.

Subgenus SUBULONA Martens, 1889.

Subulona MARTENS, Conchol. Mittheil iii, p. 9, for *S. badia, lenta* and *solidiuscula.* Nachrbl. d. D. Malak. Ges. 1895, p. 184, for *S. silvicola,* and p. 185, includes *S. castanea* and *mamboiensis.* Beschalte Weichthiere Deutsch Ost-Afrika, p. 118 (1896 ?).

Shell long, turrited, the upper part of the spire more or less attenuated; *apex obtuse, rounded,* the first whorl smooth, the *next two whorls sculptured with sharp, short folds below the suture* (or with this sculpture wanting); subsequent whorls covered with a colored cuticle which is more or less streaked with brown. Aperture small, Achatinoid.

Type *S. badia.* Distribution, tropical Africa from the west coast to the Great Lakes.

Subulona was originally proposed in 1889, and again (as new) in 1895. In 1896 von Martens, still treating it as a section of *Subulina,* defines the group as "large species with glossy brown epidermis. Similar to *Homorus,* but the last whorl smaller." No mention is made of the presence or absence of subsutural plicæ on the embryonic shell, but the figure of *S. badia* seems to indicate them. I have therefore selected that species as type of the group.

It seems likely, however, that species with smooth sutures on the embryonic shell will also be found to belong in the same group with those having crenulate sutures, since in some cases there are very minute crenulations, apparently the vestiges of former sculpture, while still other species have gone further and have lost all trace of a ribbed ancestral type. In actual practice, at the present time it is impossible to fully utilize the embryonic characters in classification, for the reason that they are not mentioned in most specific descriptions.

Species no. 19, 26 to 33 and perhaps some others have plicate sutures between the embryonic whorls. These plicæ are vestiges of ribs such as those on the embryonic shell of *Pseudoglessula.*

Species of the Lake Region and E. Africa.

11. H. CASTANEA (Martens). Pl. 60, figs. 85, 86.

Shell turrited club-shaped, with weak vertical striation and chestnut-brown, somewhat streaked glossy cuticle, pale yellow under it. Whorls 8-9, scarcely convex, the first small, rather globular, forming a blunt, wart-like apex, the following whorls regularly increasing, with impressed sutures, the last whorl rounded below. Aperture approaching ovate, only a little oblique, whitish within; outer lip thin, margined with blackish, scarcely arcuate; basal margin broadly rounded; columellar margin arcuate, distinctly truncate below (*Martens*).

Length 47, diam. 13.5, aperture 12 x 8.5 mm.; whorls 9.

Length 54, diam. 15, aperture 14 x 8 mm.; whorls 10.

Length 37, diam. 13, aperture 11.5 x 7 mm.; whorls 8 (*clavata*).

East Africa: Runssoro, at about 2500-3800 meters, in moss of an Ericina woods, and in bamboo forest; also Wembere Steppe (Stuhlmann).

Subulina castanea MARTS., Sitzungsbr. d. Ges. Nat. Freunde, 1895, p. 129; Beschalte Weichthiere p. 118, pl. 5, f. 7, 8, and var. *clavata*, p. 119, f. 9.

The shell, according to von Martens, is rather variable in proportion of length to breadth, of a usually brilliantly glossy chestnut-brown color, with more or less dark streaks, sometimes lighter yellowish streaks also. Of spiral striæ there is only something to be seen on the uppermost whorls. There is a more club-shaped form (var. *clavata*, fig. 86), which increases in diameter more rapidly from the beginning, and a more elongated (typical, fig. 85) less rapidly widening. In the more club-shaped shells the height of the last whorl, measured behind, is more than one-third that of the shell; in the elongated shells it is somewhat less than one-third.

12. H. MAMBOIENSIS (Smith). Pl. 60, fig. 83.

Shell elongate, subulate, somewhat club-shaped; white, covered with a yellowish and streaked epidermis. Whorls 10, a little convex, slowly increasing, striated with oblique, delicate growth-lines and under a lens seen to be sculptured with close microscopic spiral lines. Suture oblique, rather deep; apex mamillar. Aperture whitish, subovate, a little acuminate above and below, one-fourth the total length; columella arcuate, covered with a thin white callous, abruptly truncate in front; lip thin, regularly curved. Length 46, diam. 13.5 mm.; aperture 11.5 long, 6.5 wide (*Smith*).

East Africa: on the plains within 50 miles of Mamboya (Last); Lukwangule Mt., in central Uluguru (Stuhlmann).

Stenogyra (*Subulina*) *mamboiensis* SM., Ann. and Mag. N. H. (6), vi, 1890, p. 158, pl. 5, f. 16.—*Homorus m.*, KOB., C. Cab. p. 104.—*Subulina* (*Subulona*) *m.*, MARTENS, Beschalte Weichthiere, p. 119, with varieties *nitida* and *circumstriata*, pl. 5, f. 10.

An egg from one of the specimens is elongate-ovate and 5 mm. in length (*Smith*). It differs from *S. castanea* chiefly by the attenuation of the early whorls, producing a cylindric summit. Two varieties are described by Prof. von Martens, as follows:

Var. *nitidus* Martens.

Cuticle strongly glossy, pale yellow with numerous dark brown streaks; suture from the fifth to seventh whorls onward, distinctly accompanied by a furrow, producing a granose sutural border. Only 2 specimens, probably not full grown, agreeing in size,—length 29, diam. 9, aperture 8 mm. long, 4 wide; whorls 7 to 8; and a larger but badly preserved shell. Migere in Butumbi, in old forest (Dr. Stuhlmann).

Var. *circumstriatus* Martens. Pl. 60, fig. 82.

Cuticle dark brown, with lighter, yellowish streaks, not glossy; very distinctly and sharply striate spirally. Length 32, diam. 11 mm.; aperture 10 mm. long, 5 wide; whorls 10.

In bamboo forest, about 2600 meters elev., Runssoro (Dr. Stuhlmann). Compare the following species.

13. H. LAGARIENSIS (Smith). Pl. 60, fig. 84.

Shell elongate, rather thin, whitish under a very thin buff cuticle; spire produced, mamillate at the apex; whorls 9, a little convex, sculptured with delicate, slightly oblique growth-lines, 3 to 4 later whorls spirally striate, more or less decussate. Aperture inversely auriform, hardly one-third the total length; lip thin, arcuate. Columella somewhat twisted, covered with a thin callous, narrowly truncate in front. Length 31, diam. 10 mm.; aperture 9.5 long, 5 wide (*Smith*).

British East Africa: Lagari (Mr. Stewart Betton).

Subulina lagariensis SM., Proc. Malac. Soc. Lond. VI, p. 69, fig. IV (March, 1904).

Allied to *S. mamboiensis* Smith, but smaller, with shorter and more convex whorls, and sculptured with spiral striæ upon the last three or four whorls, a character which is absent in that species. As in *mamboiensis*, the periostracum here and there is indistinctly streaked with brown. The lines of growth are rather stronger just below the suture than upon the rest of the surface of the whorls, and have almost a puckered appearance.'' (*Smith*).

14. H. SILVICOLA Martens. Pl. 60, fig. 87.

Shell turrited, rather slender, glossy, corneous-yellow, the apex obtuse; whorls 11, the second, third and fourth slightly convex, the diam. scarcely increasing, smooth; the following whorls slowly and regularly increasing, nearly flat, lightly striatulate, sculptured with recurved pliciform striæ below the suture, and painted with a few brownish varices; the last whorl subangular, rapidly tapering below. Aperture ovate rather oblique, occupying two-ninths the length; outer margin thin, nearly straight, basal margin rounded, columellar margin very arcuate, dilated, distinctly truncate at the base. Length 52, diam. 12, length of aperture 11.5, width 7 mm. (*Marts.*).

East Africa: Forest region between Albert-Edward and Albert-Nyanza Lakes: between the Ngesi and Mwutan, etc. (Stuhlmann).

Subulina (*Subulona*) *silvicola* MARTENS, Nachrbl. d. d. Malak. Ges. 1895, p. 184; Beschalte Weichthiere p. 119, pl. 5, f. 20.

Intermediate between *mamboiensis* and *usagarica*, being like the first in size and color, and resembling the latter in the slimmer, less rounded form, and the sculpture.

15. H. USAGARICUS (Smith). Pl. 60, fig. 81.

Shell slender, subulate, glossy; whitish subpellucid, more or less covered with an olivaceous brown cuticle. Spire attenuate above, obtuse at the apex. Whorls 15, the apical ones slightly convex, the rest flattened, slowly increasing; growth-lines oblique, arcuately subplicate above at the suture; suture slightly crenulate and oblique; last whorl subquadrate. Aperture acute oval, one-sixth the total length. Columella arcuate, truncate in front, covered with a thin callous. Length 37, diam. 7 mm.; aperture 7 mm. long, 3.5 wide (*Smith*).

East Africa: Usagara (Bishop Hannington); Kidete (Emin Pasha).

Stenogyra (*Subulina*) *usagarica* SM., Am. and Mag. N. H. (6), vi, p. 158, pl. 5, f. 17.

This is a very elongate species with almost flat whorls. The subplicate lines of growth, especially on some of the upper volutions, give the sutural line a somewhat crenulated appearance. *S. foxcrofti* Pfr. from Sierra Leone has longer and more convex whorls and they are fewer in number. (*Smith*).

16. H. SOLIDIUSCULUS (Smith). Pl. 60, fig. 88.

Shell elongate, subulate, rather solid, imperforate, white, covered with a thin olivaceous epidermis, obliquely striated by the lines of growth which are crossed by shallow spiral striæ producing a somewhat granose or wrinkled surface. Lateral outline rectilinear, slowly converging, apex obtuse, truncated. Remaining whorls 8 in number, very slightly convex and slowly increasing, separated by a rather horizontal, simple, distinct suture. Aperture short, and the columella curved. Probable length of a perfect specimen 52 millims; actual length of shell, consisting of eight volutions, 43 mm., diam. 11; aperture 9 long, 5.5 broad. (*Smith*).

Near Lake Tanganyika (Thomson).

Subulina solidiuscula Sm., Ann. Mag. N. H. 1880, vi, p. 428; P. Z. S. 1881, p. 285, pl. 33, f. 16.

This species and the next probably will prove, when the apices are examined, to belong to *Subulona*.

"Of this interesting form only a single specimen was obtained. It is comparatively solid for a shell of this genus, and also remarkable on account of the very elongate form and the exceptionally slow increase of the volutions. The apex of the shell is obtusely truncated, but this may be the result of an accident in this instance, and not a constant specific character. The spiral or transverse striæ are but feebly impressed, but crossing the fine lines of growth give them a crinkled appearance." (*Smith*).

17. H. lentus (Smith). Pl. 60, fig. 79.

"Shell subulate, imperforate, very slowly enlarging, very elongate and narrow. Whorls—? (probably 11 or 12), very slightly convex, covered with a thin, glossy, pale olivaceous epidermis, varied at intervals with darker oblique stripes. Suture simple, rather oblique and deepish. Sculpture consisting of fine oblique and feebly flexuous lines of increment, faintly puckered at the upper extremity. Aperture small, occupying less than one fifth of the entire length. Columella very arcuate, abruptly truncated at the lower extremity. Probable length 41 mm., actual length of seven remaining whorls 36; diameter of the last whorl 7½, of the penultimate 7, of antipenultimate 6⅓; aperture 7½ long, 4 broad." (*Smith*).

Near Lake Tanganyika (Thomson).

Subulina lenta Sm., Ann. and Mag. N. H. (5), vi, p. 428 (1880); P. Z. S. 1881, p. 284, pl. 33, f. 15.—Bgt., Moll. de l'Afrique Equatoriale etc., p. 114, pl. 5, f. 5 (1889).

"The brevity of the aperture in proportion to the total length of the shell, its narrow elongate form, and the slow increase of the whorls constitute the chief characteristics of this species. *Spiraxis bistorta* of Pfeiffer has a considerable resemblance to it but has more convex whorls, a longer aperture, and a different columella." (*Smith*).

Bourguignat states that this species occurs on the peninsula of Ubuari, which projects from the west side of Tanganyika. It is very rarely found entire, he writes, the early whorls being almost always wanting. When entire the excessively elongated spire is pyramidal, with 17 or 18 whorls (pl. 60, fig. 80).

18. H. CYLINDRACEUS (Bourguignat). Pl. 57, figs. 29, 30.

Shell very long cylindric, rather solid, somewhat opaque, slightly shining, uniform corneous-buff; striatulate and at the suture crispulate. Spire very much produced, cylindric, scarcely tapering, obtuse at the summit. Whorls 17, convex, closely coiled, separated by a rather deep suture; the last whorl moderate, convex. Aperture suboblique, ovate; peristome unexpanded, acute; columella short, slightly curved, abruptly truncate below; outer margin straight, slightly retreating; parietal callous rather thick. Length 37, diam. 5, alt. apert. 5, width 5 mm. (*Bgt.*).

East Africa: Ubuari peninsula, west side of Tanganyika, in woods.

Subulina cylindracea BGT., Moll. de l'Afr. Equatoriale, p. 115, pl. 5, fig. 2, 3 (1889).

This singular Subulina, resembling a *Rhodea,* is so long that it is almost always broken; but with the fragments it is easy to reconstruct it (*Bgt.*).

19. H. JOUBERTI (Bourguignat). Pl. 57, fig. 31.

Shell slender, very long, cylindric, translucent, pale buff, well striated, crispate at the suture. Spire much produced, cylindric, a little tapering, at the summit obtuse and as if mamillate. Whorls 12, convex, closely coiled, separated by a deep suture, the last whorl minute, convex. Aperture oblique, ovate; peristome unexpanded, acute; columella short, curved, abruptly truncate; with no parietal callous. Length 20, diam. 3.5, alt. aperture 3.5, width 2.5 mm. (*Bgt.*).

East Africa: Wooded districts of Ubembe, on the west coast of Tanganyika.

Subulina jouberti Bgt., Moll. Afr. Equat. p. 115, pl. 5, f. 4 (1889).

20. H. SOWERBYANUS (Morelet). Pl. 59, figs. 72, 73, 74.

Shell imperforate, subulate-turrite, thin, smooth, glossy, striatulate, deep chestnut-colored. Spire elongate, the apex obtuse. Whorls 11, plano-convex, joined by an impressed suture, the last whorl scarcely one-fifth the total length. Columella short, slightly arcuate, obliquely truncate, not reaching the base. Aperture small, oblong-semioval, subangulate at the base; columellar margin straightened, the other simple and unexpanded. Length 32, diam. 7 mm. (*Morel.*). Length 33.5, diam. 7 mm.; whorls 11¾ (*Specimen*).

Near Tanganyika (Sowerby.).

Stenogyra sowerbyana Morelet, Journ. de Conch. 1890, p. 67, pl. 1, f. 3.—*Homorus s.*, Kobelt, Conchyl. Cab. p. 114.—*Subulina* (*Subulona*) *s.*, Martens, Beschalte Weichthiere p. 120.

The original figures, one of which is copied in my fig. 74, do not represent the type specimen, but a much smaller one. Figs. 72, 73 are from a specimen similar to the type. The color is yellowish-brown with scattered narrow dark oblique streaks. The whorls are moderately convex, finely, irregularly striate, and under the lens are seen to be decussated on the last 5 or 6 whorls. The last whorl is not angular, but there is an obscure line at the periphery giving it an angular appearance. Below this line it is extensively denuded in front. The cylindric embryonic shell consists of 3¾ whorls, the first one smooth, then begin short, acute subsutural folds, rather widely spaced on the second and third whorls, but becoming more crowded on the last part of the embryonic shell, the termination of which is indicated by an oblique brown line (see pl. 59, fig. 73).

West African Species.

21. H. OLEATUS (Martens). Pl. 57, figs. 32, 33.

Shell conic-turrite, thin, vertically striatulate, with an oily luster, yellowish. Apex rather obtuse; whorls 8, the first and second globose, smooth, the following whorls regularly increasing, somewhat convex, the suture simple; last whorl ovate. Aperture one-third the total length, subvertical, obliquely piriform-elliptical; peristome thin, the columellar margin very arcuate, transversely truncate at the base; parietal callous very thin. Length 22. diam. 8, length of aperture 7.5, width 4.5 mm. (*Marts.*).

West Africa: Bonjongo, Camroons. (Buchholz).

Stenogyra oleata MARTS., Monatsbr. K. P. Akad. Wissenschaften zu Berlin, 1876, p. 261, pl. 3, f. 9-11.—*Homorus oleatus* KOBELT, Conch. Cab. p. 106.

Nearest to *suaveolens* Jick. among known African forms, but the spire is more slender, the aperture narrower. Of the total length of the shell, one-third is measured to the insertion of the outer lip; the penult. and next earlier whorls comprise another third, while the rest of the volutions complete the last third. (*Marts.*)

22. H. FOXCROFTI (Pfeiffer).

Shell cylindric-turrite, rather solid, irregularly striatulate; whitish under a deciduous corneous cuticle. Spire turrited above, the apex obtuse, then cylindric; suture subcrenulate. Whorls 12½, a little convex, the last scarcely one-fifth the total length, rounded basally; columella arching forward, distinctly and narrowly truncate. Aperture oblique, oval; peristome simple and unexpanded. Length 35, diam. 6.5 mm.; aperture 6.5 mm. long, 3.66 wide (*Pfr.*).

West Africa: Sierra Leone (Cuming coll.).

Achatina foxcrofti PFR., P. Z. S. 1861, p. 25; Malak. Bl. 1861, p. 78; Monogr. vi, p. 231.

Unfigured; and known only by the above description. Probably belongs near *involuta*.

23. H. PATTALUS Pilsbry, n. sp. Pl. 59, figs. 65, 66, 67, 68.

Shell turrited, with rather straight spire, only very slightly attenuated above, terminating in a large, very obtuse apex; thin but moderately solid; yellowish olive, profusely and irregularly, obliquely streaked with brown and blackish-brown, the embryonic 3¾ whorls clear olive. Surface somewhat glossy showing a weak, coarse striation in places, and when highly magnified a dense, wavy spiral striation, weakly and shortly plicate below the sutures. Whorls 9¾, weakly convex, the first forming the rounded, half-globular summit; first 3½ to 3¾ whorls smooth and glossy, with only faint subsutural crenulation, cylindric, terminated by an oblique dark streak. Last whorl sharply angular in immature shells, becoming rounded in adults, the angle still noticeable in front of the aperture, but continued merely as a dark line. Aperture acutely ovate, the columella very concave, very narrow, truncate; parietal wall not at all calloused. Length 37, diam. 9 mm.; length of aperture 9, diam. of third whorl 3 mm.

West Africa: Cape Palmas, Liberia, (A. N. S. P.).

Distinguished by its large smooth embryonic shell, obsolescence of the peripheral keel in adult shells, and for the small number of whorls in its length.

24. H. NIGELLUS (Morelet). Pl. 57, fig. 34.

Shell subulate, slender, finely striolate, glossy, dark brown. Spire elongate, the apex rather mucronate; suture impressed, in places denticulated by the striæ. Whorls 12, plano-convex, the last one small, obtusely angular below the middle, nearly one-fifth the total length. Columella arcuate, obliquely truncate. Aperture small, semioval, whitish within; peristome simple, thin, unexpanded. Length 17, diam. 3 mm. (*Morel.*)

West Africa: *Presidio* of Pungo-Andongo, in moss on the banks of the Rio Casabale (Welwitsch).

Achatina nigella MOREL., Voy. Welwitsch p. 80, pl. 5, f. 3 (1868).—PFR., Monogr. viii, 287.

The shell is engraved with fine, oblique, irregular striæ, which become more emphatic and even pliciform near the suture. The color is chestnut-brown, glossy and uniform (*Morel.*).

25. H. NEBULOSUS (Morelet). Pl. 57, fig. 37.

Shell turrited, thin, smooth, glossy, buff-corneous, a wide paler band along the suture. Spire very straight, gradually tapering, the apex somewhat obtuse. Whorls 15, planulate, joined by an impressed suture, the last slightly angulated at the base, nearly one-fifth the total length. Columella arcuate, obliquely truncate. Aperture oval, biangular, the outer margin simple, unexpanded. Length 27, diam. 5 mm. (*Morel.*).

West Africa: Landana, above the mouth of the Congo river.

Stenogyra nebulosa MOREL., Journ. de Conch. 1883, p. 400, pl. 10, f. 5.—*Subulina nebulosa* CROSSE et FISCHER, in Grandidier, Madagascar, Moll., pl. 24, fig. 3, a, b.

According to Morelet this species closely resembles *Subulona fraseri* (= *involuta*); the two being of the same size, and alike in polish, luster and nearly so in color; but *nebulosa* is thinner, more slender, more regularly increasing, with 15 whorls, which are *smooth*, very glossy, etc. I do not know why this species has been figured among the mollusks of Madagascar.

26. H. MARTENSI Dupuis et Putzeys. Pl. 60, fig. 78.

Shell solid, a little shining, elongate, subulate; pale-buff or whitish, covered with a chestnut epidermis, painted with transverse blackish flames. Whorls 11, the second depressed-convex, forming a mamillar apex with the first whorl; following whorls rather convex, slowly and regularly increasing, striated with very fine oblique growth lines, here and there iregularly plicate transversely; decussated with numerous inequidistant microscopic spiral striæ; the last whorl is indistinctly subangulate; suture oblique, rather deep, usually margined below. Aperture blue-whitish, a little acuminate above, slightly exceeding one-fifth the length of the shell. Columella regularly arcuate, covered with a very thin white callous, anteriorly abruptly truncate. Lip thin, regularly curved; peristome in adults generally edged with black. Length 55, diam. 14, alt. of aperture 12, width 7.5 mm. (*D. et P.*).

Congo: Nsendwe (P. Dupuis).

Subulina (*Subulona*) *martensi* Dup. et Putz., Bull. des Seances Soc. Roy. Mal. Belg. 1901, p. xxxvii. f. 9.

"This species especially approaches the *Subulona castanea* var. *clavata* v. Marts.; but in that the penult. whorl is comparatively higher for its length, and it is more glossy. Moreover, the number of whorls in our species exceeds that given for *S. castanea.*" (*D. et P.*)

The animal is uniform dark gray and the foot is small. It is viviparous.

27. H. badius (Martens). Pl. 60, fig. 75.

Shell turrited, imperforate, closely and finely decussate, rufous-brown with rare black-brown streaks, glossy. Whorls 11, slightly convex, separated by an impressed, crenulated suture, the first two forming a short apical cone, the third, fourth and fifth whorls subequal, the following whorls slowly increasing. Last whorl slightly angular on a line with the end of the suture, tapering beneath. Aperture quite oblique, lanceolate-ovate, occupying two-ninths the shell's length. Parietal wall and columellar margin deeply sinuated, greenish-yellow, the columella obliquely truncate below. Length 63.5, diam. 13.5, aperture length 13, diam. 9 mm. (*Marts.*).

Congo river.

Stenogyra badia Marts., Conchologische Mittheilungen iii, p. 8, pl. 38, f. 13, 14 (Dec. 1889).

Nearest allied, von Martens writes, to *Subulina lenta* Edg. Smith, from the neighborhood of Tanganyika, but is distinct by its decussate sculpture and granose suture, as well as by the somewhat stronger inflation of the last whorl. These two and the *Sub. solidiuscula* E. Smith, seem to form a special African group of species, differing from other Subulinas by the size, dark coloring and distinct epidermis, and which may be distinguished by the term expressive of enlargement, *Subulona.*

28. H. involutus (Gould). Pl. 59, figs. 70, 71.

Shell turrited, elongate, the apex mamillate; imperforate, brownish; whorls 12, lightly striate, the upper four subequal, the last whorl carinated; suture impressed, very minutely crenulated. Aperture ovate, a sixth the length of the spire; columella arcuate, involute, forming a tube. Length 1.1, width .25 inch. (*Gld.*).

West Africa: Cameroons at Bonge and Itoki (d'Ailly); Cape Palmas, Liberia; on the banks of the Nun river (Fraser, type loc. of *A. fraseri*); Sierra Leone at Freetown (Welwitsch); Togoland at Bismarckburg (Buettner).

A slender, club-shaped shell, brown with irregularly-spaced narrow darker streaks, the apex obtuse, rounded, rather large, several whorls following not increasing in diameter. The first whorl is smooth; the second has sharp, narrow, short and widely spaced folds below the suture. On the third whorl these folds are somewhat reduced. The whole protoconch consists of nearly 3½ whorls. At the beginning of the post-embryonic growth the surface becomes somewhat dull, contrasting with the glossy protoconch, and at the suture it is rather finely crenulate or puckered (pl. 59, fig. 70).

Achatina involuta Gld., Proc. Bost. Soc. N. H., i, 1843, p. 158.—Reeve, C. Icon. v, pl. 17, f. 88.—Pfr., Monogr. iii, p. 500; Conchyl. Cab. p. 343, pl. 37, f. 21, 22.—*Pseudoglessula involuta* d'Ailly, Bihang, p. 109.—*Achatina fraseri* Pfr., Symbolæ iii, p. 90 (1846); Monogr. ii, p. 263.—Philippi, Abbild. ii, p. 216, pl. 1, f. 6.—Reeve, C. Icon. v, pl. 16, f. 71.—*Subulina involuta* Marts. Mittheil. aus d. d. Schutzgeb., vi, Heft, 3 (1893).

Gould's description is given above. Adolf d'Ailly has more fully described this species thus: "Shell turrited-subulate, the apex cylindrical, rather obtuse, subpapillar; irregularly striate, polished, whitish-greenish, here and there streaked with darker, under a corneous-brown cuticle, usually worn off of the apertural side; under the lens hardly visibly striate spirally and very densely. Spire-subconcave towards the apex, the rest subcylindric, whorls 13, the first and second subglobose, smooth, the suture regularly and distantly crenulated; following whorls plano-convex, irregularly plicate-crenulate at the suture, the last whorl not one-fourth the total length, subangular below, the angle darker. Columella arcuate, abruptly truncate, white-margined. Aperture subtetragonal-semioval; peristome thin, unexpanded, simple. Length 31-32.5, diam. 6 mm.; aperture 6 mm. long, 3.5 wide (*d'Ailly*).

The spiral sculpture mentioned by d'Ailly in the above description of Cameroon shells, I have not been able to trace in the series of specimens before me from Cape Palmas, which was the original locality of *involuta*. Pfeiffer's *A. fraseri* presents no differential characters, and was recognized by him as equivalent to *involuta*.

29. H. OPEAS Pilsbry, n. sp. Pl. 59, figs. 60, 61, 62.

Shell turrited, very slender, the upper part of the spire much attenuated with slightly concave outlines; thin; dark brown, with numerous oblique narrow darker streaks, the apex yellowish brown. Surface lusterless, nearly smooth, very faintly marked with growth lines; under the suture it is very weakly and shortly plicate. Whorls nearly 12; apex obtuse; first whorl very convex, with deep suture; its first half smooth; then short, strong, narrow folds appear below the suture; they are rather widely spaced, and continue two whorls, then become finer and much closer, and abruptly stopping at the end of the embryonic shell of 3½ whorls (pl. 59, fig. 62). The whorls are all quite convex, the last one encircled with a narrow, acutely raised peripheral keel; in front of the aperture it is partially denuded of cuticle. Aperture ovate, bluish inside. Columella somewhat arcuate, abruptly truncate at base. Outer and basal lips thin and acute. Length 19.7, diam. 4.4 mm.; length of aperture 3.7 mm.; diam. of embryonic shell (3d. whorl) 1.4 mm.

West Africa: Cape Palmas (A. N. S. P.).

This awl-shaped species is far more slender and attenuate than *H. involuta*. It has a more projecting keel, smaller aperture and more pronounced subsutural crenulation. It is a somewhat wider shell than *H. nigella* Morel., and differs from

H. nebulosa Morel. in color, the attenuate spire, strong peripheral keel, etc.

30. H. SUBCRENATUS (Boettger).

Shell large, not rimate, turrite, club-shaped, thin, glossy, corneous-yellowish, covered with a brownish cuticle irregularly ornamented with numerous obsolete darker streaks; darker towards the aperture. Spire cylindric-turrite, the apex mucronate, cylindric, obtuse. Whorls 12, very slowly increasing, wider than high, a little convex, separated by a slightly impressed suture, distinctly crenate from the beginning, striatulate, the striæ deeper and more distinct at the suture; the last whorl well rounded, its height one and one-half times that of the penultimate whorl, and, scarcely one-fourth the length of the shell; the base usually worn. Aperture irregularly ovate, more acute above than below. Columella slender, deeply concave, sigmoid, abruptly truncate at base, deeply excised and canaliculate, the margins joined by a thin callous. Length 54, diam. 13.5, diam. of third whorl 3 mm.; alt. of aperture 13, width 7.5 mm. (*Bttg.*).

West Africa: Akkra on the Gold coast (E. St. Vraz).

Pseudoglessula subcrenata BTTG., Nachrbl. d. d. Malak. Ges. 1892, p. 202.

"Differs from the West African *Pseudoglessula* species known to me by the blunt, cylindric summit set upon a somewhat club-shaped shell, the suture from the apex on appearing very strongly crenulated. These sutural denticles gradually diminish, but usually are lost only on the last whorl towards the mouth" (*Bttg.*).

31. H. BACILLIFORMIS (Jonas). Pl. 59, fig. 69.

Shell long-turrited, narrow, thin, fragile, milk-white covered with a buff cuticle, longitudinally striated. Whorls 9 (the upper ones broken), a little convex, slowly increasing, separated by an impressed suture, which is seen to be crispate under a lens; the last whorl small. Aperture small, oval; columella arcuate, truncate; lip simple. Length of specimen broken above 11.5, width of last whorl 2.5 lines [about 23 x 5 mm.] (*Jonas*).

West Africa: Guinea.

Achatina bacilliformis JON., Zeitschr. f. Mal. 1846, p. 13; and in Philippi, Abbild. etc. ii, p. 215, pl. 1, f. 8.—PFR., Monogr. ii, p. 264; iv, 611.

Described from a specimen with the apex broken off. Pfeiffer remarks: "The shell, like many land shells from Guinea, is very delicate, fragile and with a silken luster, very finely and delicately striate, the whorls rather flat, the last one short; the columella is pretty well-curved and strongly truncate."

The spire seems more straightly conic than in *involuta* and its immediate allies.

32. H. DECOLLATUS (Morelet). Pl. 59, figs. 63, 64.

Shell decollate, thin, cylindric-turrited, greenish-corneous, pellucid, glossy, marked with obsolete, irregular oblique streaks. Suture minutely denticulate in the early whorls of entire shells, in the rest submarginate. The 5½ whorls remaining are rather flattened, slightly contabulate, the last obtusely angulate at the periphery, two-sevenths the total length. Columella arcuate, obliquely truncate. Aperture moderate, acutely oval, the margins simple and unexpanded. Length 30, diam. 9 mm. (*Morel.*).

West Africa: Gabun (Marche and de Compiegne).

Achatina (*Stenogyra*) *decollata* MORELET, Journ. de Conchyl. 1873, p. 330.—PFR., Monogr. viii, p. 286.—*Stenogyra invalida* MOREL., J. de C. 1885, p. 23, pl. 2, f. 15, *a. b.*

This species was named *decollata* on account of its resemblance to *Rumina decollata.* The two shells at adult age are truncated at the same height, ordinarily leaving 4 whorls. In the Gabun species the spire begins to be truncate when the shell attains a length of 13 mm. The partition which stops the breach is analogous in the two species. Morelet subsequently changed the name of this species to prevent confusion with the European *R. decollata* L.; but no change was necessary.

33. H. PYRAMIDELLA Martens.

Shell conic-turrite, lightly striatulate, glossy; gray-whitish, marked with numerous unequal brown streaks. Whorls 9, equally increasing, very slightly convex, the upper three unicolored whitish, more strongly striate, the first small, oblique, second globose, more distinctly costulate, the last whorl rounded basally. Aperture rhombic-oblong, acutely angular above, the outer lip thin, slightly arcuate; the basal margin rounded; columellar margin thickened, a thin callous covering the columellar and parietal margins. Length 16, diam. 6.5, length of aperture 5, width 4 mm. (*Marts.*)

West Africa: Buea, Kamerun, in old forest, especially on *Marattia fraxinea* (Dr. Preuss).

Achatina (*Homorus*) *pyramidella* MARTS., Sitzungsber. Gesellschaft naturforsch. Freunde zu Berlin, 15 nov., 1892, p. 181. Cf. Beschalte Weichthiere D. O.-Af., p. 116.—*Homorus* (*Pseudoglessula*) p., KOBELT, Conchyl. Cab. p. 114.

From the description of the apex, translated above, I would be disposed to place this species in *Pseudoglessula,* following Kobelt; but the pale and streaked coloration is unlike that group. Moreover, von Martens has emphatically stated that it is not a *Pseudoglessula.*

34. H. LUGUBRIS (Morelet). Pl. 60, figs. 76, 77.

Shell turrited, solid, closely and irregularly granose-striate, silky, chestnut-blackish obscurely striped with darker streaks. Spire elongate, the apex rather obtuse. Suture impressed, crenulate. Whorls 14, subplanulate, the first smooth, summit pale corneous, the rest decussate with hair-like striæ, larger at the sutures, and inconspicuous transverse impressions; the last whorl angulate at base, less than one-fifth the total length. Columella short, curved, abruptly truncate. Aperture small, oblong, violaceous within; peristome simple, unexpanded, the columellar margin denuded of cuticle, buff. Length 61, diam. 10, length of aperture 11 mm. (*Morelet.*)

West Africa: Landana, above the mouth of the Congo.

Stenogyra lugubris MOREL., Journ. de Conchyl. 1883, p. 399, pl. 10, f. 4.

This species is remarkable for the large number of whorls, fourteen, and the solid texture. It is covered with a fine, crowded, irregular costulation with the exception of the first four whorls, which are smooth except for a short and elegant sutural denticulation.

Genus CERAS Dupuis et Putzeys, 1901.

Ceras D. et P., Bulletins des Seances, Societe Royale Malacologique de Belgique, 1901, Seance du 6 juillet, p. xxxviii.

"Shell thin, covered with a very thin cuticle. Embryonic first whorl at first obliquely ascending, then horizontally involuted over the left part of the spire, forming an excentric concave apex. Following whorls numerous, slowly increasing, flattened, forming a long, subulate spire. Last whorl truncate-carinate, the keel projecting, bimarginate. Columella regularly very concave, abruptly truncate in front. Aperture subquadrate, the lip simple." (*D. et P.*).

The two species known are viviparous, those examined containing fifteen or twenty embryonic shells. This character, the uniform gray color of the animal and its small foot, are similar to *Subulona martensi,* and both differ from the true Subulinas of the same region, which are oviparous, with the animal outwardly yellow or yellowish and the foot is more lengthened. (*D. et P.*)

Type *C. dautzenbergi*. Distribution, Congo basin.

This group is known to me only by the above description.

1. C. DAUTZENBERGI Dupuis et Putzeys. Pl. 44, fig. 3.

Shell very glossy, translucent, covered with a chestnut epidermis, irregularly marked transversely with dark lines. Whorls 12, sculptured with delicate oblique, usually wavy growth-lines and occasional folds, and numerous inconspicuous spiral striæ. Length 30, diam. 6, length of aperture 4.5, width 3 mm. (*D. et P.*).

Congo: Nsendwe (P. Dupuis).

C. dautzenbergi D. et P., *t. c.,* p. xxxviii, f. 10.

2. C. MANYEMAENSE Dupuis et Putzeys. Pl. 44, figs. 4, 5.

Shell a little glossy, translucent, pale buff-gray. Whorls

12, densely decussated with delicate oblique growth-lines and numerous spiral striæ. Length 34.5, diam. 7, length of aperture 6, width 3.5 mm. (*D. et P.*)

Congo: Nsendwe (P. Depuis).

C. manyemaense D. et P., *t. c.,* p. xxxviii, f. 11, 12, 13; with var. *cingulata,* p. xxxix.

Distinguished from *C. dautzenbergi* by the less glossy shell, the spire forming a less acute cone, and especially by its more emphatic sculpture.

Var. *cingulatum* D. et P. It is distinguished by a double brownish narrow band parallel to the suture on the upper part of the whorls of the spire. It inhabits the same locality as the type (*D. et P.*).

Genus PSEUDOGLESSULA Boettger, 1892.

Pseudoglessula Bttg., Nachrichtsblatt der deutschen Malakozoologischen Gesellschaft, xxiv, p. 202, Dec. 1892, for *A. calabarica* Pfr. and its allies.—d'Ailly, Contributions a la connaissance des Mollusques terrestres et d'eau douce de Kameroun, in Bihang till K. Svenska Vet.-Akad. Handlingar, xxii, pt. iv, no. 2, p. 100 (1896).

Shell imperforate, ovate or oblong-turrited, rather thin, ribbed or rib-striate, covered with a thin brownish or greenish cuticle which is often partially worn off the apertural side. *Apex obtuse,* rounded, the tip more or less turned in; *two embryonic whorls vertically ribbed or reticulate.* Last whorl with a *thread-like or subobsolete peripheral keel,* smoother below it. Columella concave, *truncate at the base;* outer lip thin, simple or perceptibly expanded.

Teeth (pl. 62, fig. 18, *P. leroyi,* after v. Marts.) with the centrals narrow, unicuspid; inner lateral tooth bicuspid.

The anatomy is otherwise unknown. *P. calabarica* is ovoviviparous, most of the other species are oviparous; the eggs are markedly *oblong,* very pale yellow, or white, and lie obliquely in the oviduct.

Type *P. calabarica* (Pfr.). Distribution, tropical Africa.

The aperture, especially in the East African forms, is remarkably like that of *Glessula.* In a few species from the

Great Lake region the columellar truncation is subobsolete; and some additional forms now classed as *Buliminus* may be found to belong to *Pseudoglessula*.

It is to be regretted that d'Ailly, who had an abundance of alcoholic specimens, did not describe the anatomy. Von Martens' figure of the teeth of *Ps. leroyi* does not show the marginal teeth intelligibly but the central and lateral teeth are Achatinoid, and differ from those of *Homorus* in wanting an inner cusp on the lateral tooth. Dupuis' observations on the external features of *P. humicola,* are given under that species (sp. no. 8). The flat, bifid tail and bordered foot (pl. 62, fig. 26) are remarkable features; but that species may not be a true *Pseudoglessula*.

In *P. retifera* the pale whitish yellow eggs measure 4 x 2⅔ mm.; in *P. sjostedti* they are pure white, mat, 5 x 3 mm.

West African Species.

Embryonic whorls vertically ribbed, species 1 to 9.
Embryonic whorls reticulate-pitted, species 10 to 12.

1. P. CLAVATA (Gray). Pl. 61, figs. 11, 12.

Shell lanceolate, thin, pellucid, white; whorls 11 or 12, rather convex, closely concentrically grooved; last with a spiral, slightly-raised keel, and smooth in front; the apex club-shaped, with more distant, sharp and elevated ridges (*Gray*).

West Africa: Sierra Leone (Mr. Speck, type loc. of *clavata*); Old Calabar (Cuming coll., type loc. of *A. calabarica*); Kamerun at Etome, Bomana, N'dian, Bonge, Isowi, Buea, Bibundi, Bonjongo (Buchholz, Sjostedt, and others).

Acatina clavata GRAY, The Magazine of Natural History etc., conducted by Edward Charlesworth F. G. S., i, new ser., p. 487 (Sept. 1837).—PFR., Monogr. Hel. Viv: ii, p. 260; iii, 498; iv, 609; vi, 230.—REEVE, C. Icon. v, pl. 16, f. 72.—*Pseudoglessula clavata* d'AILLY, Bihang, p. 100, f.1-4.—*Achatina calabarica* PFR., Proc. Zool. Soc. 1865, p. 832; Monogr. vi, p. 229.—*Stenogyra c.*, MARTENS, Monatsbr. K. P.

Akad. Wissensch. 1876, p. 260, pl. 3, f. 5, 6.—*Pseudoglessula c.*, BTTG., Nachrbl. d. d. Malak. Ges. 1892, p. 202.—*Homorus* (*Ps.*) *c.*, KOBELT, C. Cab. p. 93, pl. 22, f. 3, 4 (1894).

Gray's original description, given above, is without dimensions. Pfeiffer in the second volume of the *Monographia* has described a specimen in the British Museum as 28 mm. long, 13 wide. This is presumably one of Gray's types, since he mentions the species as in the "collection of the British Museum, Mrs. Mauger's and my own." The types were from Sierra Leone, a country somewhat distant from Old Calabar and Cameroons, where the species (under the name *calabarica*), is common.

Var. *grayi* d'Ailly (pl. 61, fig. 10). Reeve in the *Conchologia Iconica* figures a much more slender shell from Cuming's collection under the name *A. clavata*. It is evidently this which d'Ailly desires to call *P. clavata var. grayi*. It will probably be found to be specially distinct from *clavata*.

Adolf d'Ailly has discussed the literature and characters of this species at length, having at his disposal some 54 specimens. The largest measure length 45, diam. 17 mm., with 10 whorls (fig. 12). Eleven specimens from a dark and humid forest at Bonge are 24 mm. long, only 8 wide, with 9½ whorls, corresponding perfectly with Reeve's figure of *clavata*. Between these extreme forms there are transitions, so that he concludes that in this case the contour of the shell is a character of but small importance, and therefore no specific distinction can be made between *clavata* and *calabarica*. The difference of color noted in the original descriptions is due to the partially bleached condition of the type of *clavata*. The original description of *calabarica* follows:

Achatina calabarica Pfr. (pl. 61, fig. 11). Shell oblong-turrited, rather thin, closely striate, glossy; blackish-brown sometimes streaked with paler. Spire subconcavely produced, the vertex minute. Whorls 9, moderately convex, the upper ones ribbed, the last whorl one-third the total length, thread-carinate in the middle. Columella arcuate, obliquely truncate at the base of the subvertical rhombic-elliptical aperture. Peristome simple, unexpanded, the margins joined by a thin parietal callous. Length 28, diam. 11 mm.; aperture 11 mm. long, 6 wide (*Pfr.*).

Of the reproduction of this species d'Ailly writes as follows: "In several individuals we have found embryos to the number of 8 to 18, in which the spire has about 3 whorls, and the dimensions vary from 3.5 to 5 mm. long, 2.5 to 3 mm. in diameter. They are whitish, with a tinge of green—the color of the adult shell beneath the cuticle. In the largest, the peristome has a deep brown border, and in all of them the last whorl is strongly angular, with the base nearly smooth, engraved only with striæ of extraordinary fineness. The shape of the columella is exactly as in adults. The species is ovo-viviparous."

2. P. DUSENI d'Ailly. Pl. 61, figs. 1, 2, 3.

Shell oblong-turrited, thin, strongly thread-ribbed; whitish-green under a rufous-brown cuticle, paler towards the apex, here and there obsoletely streaked with darker, and readily worn off on the apertural side. Spire turrited, the apex cylindric, rather obtuse. Whorls 10½, convex, slowly increasing, separated by deep sutures, embryonic whorls subperpendicularly and regularly costulate with the exception of the smooth mammillate vertex itself; the riblets are generally evanescent below on the third whorl. Remaining whorls somewhat irregularly sculptured with strong, oblique, slightly arcuate ribs; the last whorl somewhat over one-fifth the total length with a thread-like carina below, rather flattened below it, the costulæ there transformed into striæ. Columella curved, involute, bordered with a white callous, obliquely truncate, reaching to the base. Aperture subvertical, subtetragonal, bluish-white inside; peristome simple, acute, the margins joined by a whitish very thin callous; right margin regularly arcuate, basal margin nearly straight, almost horizontal. Length scarcely 10, diam. 2.5, length of aperture 2, width 1.33 mm. (*d'Ailly*).

West Africa: Cameroons at Kitta and Ekundu Etitti (Dusen).

P. duseni d'AILLY, Bihang etc., p. 107, pl. 5, f. 8-10.

By its form and size this little species approaches *P. fuscidula* (Mor.), but it is of a darker brown color, verging into reddish instead of greenish; the shell is more solid, and the sculpture more emphatic except at the summit where it is the same in the two species. The ribs are more spaced, and less arcuate and oblique. The surface wants the silky appearance of the other species; and the ribs are darker than the rest of the shell, while in *fuscidula* they are the same color. The entire form is more slender, and in specimens of the same length, *P. duseni* has more whorls; the sculpture of the base is weaker, and its color paler.

3. P. FUSCIDULA (Morelet). Pl. 61, fig. 98.

Shell oblong-turrite, club-shaped, the apex rather acute; thin, obliquely ribbed, crystalline under a brown-greenish cuticle. Whorls 7, a little convex, the last angulated below, scarcely one-third the total length. Columella arcuate, obliquely truncate, nearly reaching to the base. Aperture semi-oval, colored within like the outside; peristome simple, acute, unexpanded. Length 8, diam. 3 mm. (*Morel.*).

West Africa: Gaboon coast (Morel.); Cameroons at Ekundu-Etitti, Boangola, Bonge and Itoki (Dusen, Sjostedt).

Achatina fuscidula MORELET, Séries Conchyliologiques i, p. 26, pl. 1, f. 9 (1858).—PFR., Monogr. vi, p. 238.—*Stenogyra* (*Subulina*) *fuscidula* PFR., Nomenclator Hel. Viv. p. 328 (1881).—*Pseudoglessula fuscidula* d'AILLY, Bihang, p. 106.

"All the characters of this pretty species assign it a position among the Pseudoglessulæ. The embryonic whorls are sculptured with regular ribs more widely spaced (especially on the first two whorls) and less oblique than those of the rest of the shell, where they are irregular and obliquely arcuate. The last whorl has a thread-like angle" (*d'Ailly*).

According to d'Ailly the type was not fully adult. The largest Cameroon shells measure 11.5 mm. long, 3 wide, with 9½ whorls. It is found not only on dead leaves but on plants as well, always solitary, never in abundance as the Subulinas are.

4. P. MUSCORUM (Morelet). Pl. 61, fig. 14.

Shell conic-turrited, thin, distantly plicate-ribbed, slightly shining; deep fulvous, obliquely streaked with brown. Apex rather acute; suture impressed. Whorls 9, a little convex, the last angular below the middle, nearly three-tenths the total length. Columella subvertical. Aperture subrhombic, small, the peristome simple, thin, unexpanded. Length 10, diam. 3.5 mm. (*Morel.*).

West Africa: in the virgin forests of Golungo-Alto, Angola (Welwitsch).

Achatina muscorum MOREL., Voy. Welwitsch p. 80, pl. 5, f. 1.—PFR., Monogr., viii, p. 293.—*Homorus m.*, KOBELT, C. Cab. p. 109.

This species has been referred to *Pseudoglessula* by Adolf d'Ailly, who however had not examined specimens. He considers it related to *P. duseni*.

5. P. STRIGOSA (Morelet). Pl. 61, fig. 13.

Shell long turrite, rather solid, pellucid, glossy, corneous-whitish or pale yellow, closely and regularly rib-striate. Spire long, the apex rather obtuse, suture impressed. Whorls 9, plano-convex, the last more dilated, not one-third the total length of the shell, obscurely angulate below the middle. Columella arcuate, obliquely truncate. Aperture semioval; peristome simple, unexpanded, thin. Length 23, diam. 7 mm. (*Morel.*).

West Africa: Golungo-Alto, Angola, on the mountain Cungolungulo, under stones and in moss under the trees (Welwitsch).

Achatina strigosa MOREL., Journ. de Conch. 1866, p. 161; Voy. Welwitsch p. 78, pl. 9, f. 2.—PFR., Monogr. vi, 235.—*Homorus* (*Pseudoglessula*) *s.*, KOBELT, C. Cab. p. 108.—*Achatina striatella* REEVE, Conch. Icon. v, pl. 17, f. 87, according to Morelet; not of Rang.

It is a quite solid, glossy shell of a pale fawn shade. The summit is obtuse, and the last whorl, which is proportionally more swollen than the others, has an indistinct angle which seems like a continuation of the suture. The sculpture is finer on the last whorl than at the summit.

6. P. ABETIFIANA Rolle. Pl. 61, figs. 8, 9.

Shell imperforate, long-ovate, rather thin, subdiaphanous, glossy, corneous-brown, costellate, the riblets equal, straight, evanescent towards the suture and periphery of the last whorl. Spire turrited, the apex obtuse. Whorls 7 to 8, a little convex, separated by an impressed, crenulate suture, slowly increasing, the last scarcely as long as the spire, rounded at the base, smooth below the middle, somewhat sculptured with fine striæ. Aperture slightly oblique, irregularly ovate, acuminate above, truncate below. Columella somewhat twisted, broadly truncate at the base; outer lip thin and fragile. Length 23, diam. 9.5 to 10 mm., alt. of aperture 9 mm. (*Rolle*).

West Africa: Abetifi on the Gold Coast.

Pseudoglessula abetifiana ROLLE, Nachrbl. d. d. malak. Gesell. xxv, 1893, p. 86.—*Homorus abetifianus* KOBELT, Conch. Cab. p. 90, pl. 2, f. 6, 7.

Nearly related to *parturitus,* but distinguished by the interruption of the sculpture at the periphery (Kobelt). Apical sculpture not described. From Kobelt's course in placing the species in *Homorus,* it seems likely that the apex has not the characteristic *Pseudoglessula* sculpture.

7. P. PHÆA Putzeys. Pl. 63, fig. 31.

Shell imperforate, ovate-turrited, rather solid, closely plicatulate-striate; brown or brownish. Spire conic, obtuse. Whorls 7, convex, regularly increasing, the first densely costulate, the last oblong, glossy, sulcate, very delicately subangulate at the periphery and marked below with a spiral impressed line. Aperture oval, the lip acute, slightly expanded, bluish white inside. Columella brown, a little straightened, arching forward, where it is narrowly tapering-truncate and folded. Margins joined by a very thin callous. Length 37, diam. 17, length of aperture 18 mm. (*Putzeys*).

Congo Valley: Forest of Waregga (zone of Manyema).

Pseudoglessula ? phæa PUTZ., Bull. des Seances, Soc. Roy. Malac. Belgique, 1898, p. lxxxv, f. 22.

A large, stout species, with the columellar truncation somewhat obsolete.

8. P. HUMICOLA Dupuis et Putzeys. Pl. 57, figs. 35, 36.

Shell elongate-turriculate, perforate, rather solid, translucent; yellow or purple-chestnut, covered with a densely and very minutely granulate brown cuticle, the last whorl more glossy and darker, generally pale at the suture. Spire elongate, conic, the apex obtuse. Whorls 7 to 8, a little convex, separated by a rather deep suture, closely rib-striate, the riblets more distant on the first two whorls, in the rest regularly decreasing, becoming similar to growth-striæ on the last whorl, which is minutely but distinctly subangulate. Lip arcuate, slightly reflexed. Aperture moderately thickened within, violaceous, acute behind; columella subvertical, usually lightly retreating in front, reflexed at the perforation, violaceous, obliquely folded with a white fold below the middle; peristome brown with reflexed edge. Length 32, diam. 15, length of aperture 14, width 8 mm. (*D. et P.*).

Congo: Nsendwe (P. Dupuis).

Pseudoglessula humicola DUP. et PUTZ., Bull. des Seances Soc. Roy. Malac. Belg. 1901, p. xxxv, f. 3, 4 (shell), 5, 6 (living animal).

The characteristic sculpture of the embryonic whorls has caused us to place this species in the genus *Pseudoglessula*. It approaches *Bulimus* (*Cerastus*) *ptychaxis* Sm., but differs in color, the smaller number of whorls and the larger size.

The foot is very flat, bifid behind (pl. 62, fig. 26). The foot is distinctly bordered, the border vertically striate. It is rose-gray, deeper on the tentacles, the mantle (within the shell) vermiculate with white spots visible through, by transparence. It lays 10 white, subspherical eggs. Lives on the ground, generally under prostrate tree-trunks (*Dupuis*).

The eggs differ from those of the typical species of the genus. It probably belongs elsewhere.

9. P. DIAPHANA Dupuis et Putzeys. Pl. 57, figs. 38, 39.

Shell imperforate, thin, fragile, pale yellow, diaphanous, but slightly shining, covered with a very thin, densely and very minutely granulated cuticle. Whorls 7, all ornamented with oblique ribs, convex, separated by a deep suture, the last whorl very indistinctly subangulate. Lip simple, thin; columella subtruncate, twisted, anteriorly retreating and somewhat plicate. Length 25, diam. 10, length of aperture 10, width 6 mm. (*D. et P.*).

Congo: Nsendwe (P. Dupuis).

Pseudoglessula diaphana D. et P., Bull. des Seances Soc. Roy. Malac. Belg. 1901, p. xxxvi, f. 7, 8.

This shell differs from the preceding in being smaller, imperforate, very thin, fragile, yellowish, pale, transparent and less glossy. The sculpture is analogous, but the riblets are more distinct on the last whorl. It differs further by the more convex whorls, deeper sculpture, the angulation very weak or almost wanting, of the last whorl, etc.

10. P. RETIFERA (Martens). Pl. 61, figs. 4, 5.

Shell ovate-turrited, thin, closely striate, opaque; olivaceous-brown, uniform or streaked with brown. Spire conic, subconcave towards the apex. Whorls 8½, the first and second large, reticulate-pitted, subglobose; the third whorl smaller; following whorls regularly increasing, with simple suture; last whorl ovate, not angular. Aperture occupying about two-fifths the total length, subvertical, sinuate-ovate, bluish inside; peristome thin, unexpanded, the margins joined by a very thin, pale callous; columellar margin arcuate, at the base obliquely truncate. Length 35, diam. 13 mm., aperture 14 mm. high, 7.5 wide (*Marts.*).

West Africa: Cameroons at Bonjongo (Buchholz), Kumbe, Bonge, Kitta, N'dian, Bibundi (Sjostedt Dusen, Jungner).

Stenogyra retifera v. MARTENS, Monatsberichte K. P. Akad. Wissensch. zu Berlin, p. 260, pl. 3, f. 7, 8 (1876).—*Homorus* (*Pseudoglessula*) *retifer* KOBELT, Conch. Cab. p. 106, pl. 30, f. 7, 8 (1895).—*Pseudoglessula retifera* d'AILLY, Bihang etc., p. 105 (1896).

"In good condition the shell is semitransparent and of a silky luster. The last whorl is not angular, but there is nevertheless a flat thread-like carina, not mentioned by von Martens." The original description was from immature specimens, according to d'Ailly, who gives the dimensions, length 41, diam. 20 mm., the aperture 14 mm. high, 7.5 wide, whorls 10.

11. P. HETERACRA Boettger. Pl. 61, fig. 96, 97.

Differs from *P. calabarica* by the olivaceous, brown-streaked and flammulate shell, the apex less acute; whorls 8, the upper 2½ very elegantly reticulate and pitted in the interstices, the rest closely striate, here and there very obsoletely spirally lineolate, the last whorl higher, almost two-fifths the alt. of the shell, at the periphery subangulate instead of being thread-carinate. Columella more curved, the base more protracted, but much less abrupt, subperpendicularly truncate. Length 31, diam. 11.5 mm.; alt. of aperture 12.5, width 6 mm. (*Bttg.*).

West Africa: Buea, Cameroons.

P. heteracra BTTG., Nachrbl. d. d. Malak. Ges. 1892, p. 202. —*Homorus* (*P.*) *heteracra* KOBELT, Conchyl. Cab. p. 94, pl. 22, f. 5-8.

Prof. von Martens considers this to be a large variety of *P. retifera*. The figures are from Kobelt.

12. P. SJOSTEDTI d'Ailly. Pl. 61, figs. 6, 7.

Shell oblong-conic, turrited, rather solid, plicate-striate, brown-olivaceous, here and there obsoletely ornamented with darker streaks. Spire concave towards the apex, which is cylindric and rather obtuse. Whorls 9½, the embryonic ones reticulate-pitted, convex; following whorls irregularly plicate-striate, the last about one-third the total length, encircled with a peripheral thread, hardly descending in front, tapering below. Columella curved, margined with a white callous, sometimes rather abruptly, sometimes obliquely truncate. Aperture subvertical, subtriangular-ovate, pearly bluish within; peristome simple, acute, thin; margins joined by a very thin callous. Length 42, diam. 15.5, mm. aperture 14 mm. long, 8.5 wide (*d'Ailly*).

West Africa: Bonge, Bibundi, Itoke, Cameroons (Sjostedt).

P. sjostedti d'AILLY, Bihang etc., p. 104, pl. 5, f. 6, 7.

Though excessively close to *P. heteracra* Bttg., this species presents peculiarities which do not permit us to consider them identical. The last whorl, which does not descend to the aperture, always has an obtuse, thread-like angle, bordered below by a noticeable depression, crossed by the fold-like striæ, which continue to the base. The spire is more concave than in other species of the group, the whorls less convex, etc.

It lives like the other species among dead leaves, most specimens having a thin but solid and adherent coat of earth on the upper surface.

East African Species.

13. P. KIRKII (Craven). Pl. 61, figs. 90, 91.

"Shell turriform, obliquely lirate, of a yellowish-brown color, sometimes marked with chocolate-colored spiral bands; epidermis glossy; apex very obtuse; spire rather elongated; whorls 7½, convex, the last occupying rather more than one-third of the entire length of the shell; labrum thin, simple; columella obliquely curved; the generic fold small, but well defined; suture deep. Length 26 mm., breadth of last whorl 12, height of aperture 10, breadth of aperture 6 mm." (*Craven*).

East Africa: Magila, with *Helix usambarica* in woods near a waterfall (Craven).

Achatina kirkii CRAVEN, Proc. Zool. Soc. Lond. 1880, p. 218, pl. 22, f. 9.—*Pseudoglessula kirki* MARTS., Beschalte Weichthiere p. 115.

Conradt found specimens also in Usambara, with four red-brown spiral bands, and others without bands. Most of them show an obtuse keel along the periphery in continuation of the suture, but more or less obsolete towards the lip. Below the keel the vertical striæ are weaker though still present;

and the more distinct the keel the more does the lower surface differ from the upper by weaker sculpture and brighter gloss. The largest shell, a banded one, measures 35 mm. long, 17 wide, the mouth 15.5 mm. long.

14. P. PRESTONI Smith. Pl. 61, fig. 93.

Shell ovate, produced above, thin, deep olive-brown, semipellucid; spire obtuse at the apex. Whorls 7, obliquely, closely, delicately ribbed, moderately convex, the last encircled with an obtuse keel at the periphery, more glossy below the keel, the ribs less strong there; scarcely descending in front. Aperture inversely ear-shaped, bluish or opalescent inside, its length about three-sevenths that of the shell. Lip thin, arcuate; columella twisted, thickened in front, pale, subtruncate, joined to the outer lip by a very thin callous. Length 28, diam. 13 mm.; aperture 12 mm. long, 7 wide. Another specimen is 30 mm. long and 13 broad (*Smith*).

German East Africa: Ukami, about 100 miles south-west of Zanzibar.

Pseudoglessula prestoni SMITH, Proc. Malac. Soc. Lond. vi, p. 68, f. II (March, 1904).

"This species is very like *P. kirki* Craven, but differs in form and in having one whorl less. The spire in that species is a trifle more slender, the body-whorl smaller, and the columella is so reflexed as to form a narrow umbilical fissure. There is also the difference of color in the two forms. Named after Mr. H. B. Preston, from whom the specimens were obtained" (*Smith*).

15. P. GRACILIOR Smith. Pl. 61, fig. 92.

Shell similar to *P. prestoni*, but narrower, lengthened, pale brownish. Whorls 8, a little convex, obliquely delicately costulate. Aperture slightly more than a third the total length. Length 28, diam. 11.5 mm.; aperture 10 mm. long, 6 wide (*Smith*).

German East Africa: Ukami, about 100 miles southwest of Zanzibar.,

P. gracilior SMITH, Proc. Malac. Soc. Lond. vi, p. 69, f. III (March, 1904).

"The two forms of *Pseudoglessula* here described, together with *P. kirki* Craven and *P. leroyi* Bourguignat, form a little group of species which are all closely related, having the same character of sculpture, form of aperture and columella, and differing principally in their general form and tone of coloration. A feature common to all is a faint carination around the middle of the body-whorl, and a more glossy surface below it. *P. gracilior* is the most slender of all the forms, and *P. prestoni* the broadest. *P. leroyi* has nine whorls, *P. gracilior* and *P. kirki* eight, and *P. prestoni* only seven. With the exception of *P. kirki,* which is often banded, all the species are of an uniform tint, varying from light brown to a dark olive-brown. *P. subcarinifera,* Smith, is a diminutive form belonging to the same group." (*Smith*).

16. P. LEROYI (Bourguignat). Pl. 61, fig. 89.

Shell lengthened, moderately swollen, rather thin, subpellucid, glossy, uniform red-chestnut or somewhat wine-colored (or in some specimens the color is a pale olivaceous yellow tint), paler at the base of the columella. Elegantly lamellate, the lamellæ regular, close, stronger and more spaced at the summit, more delicate on the lower part; and encircled at the periphery with a more glossy, obsoletely subnodulose spiral sulcus. Spire long, acuminate, but rather obtuse at the summit. Whorls 9, convex, regularly and slowly increasing, separated by the well-impressed suture; the last whorl over one-third the length, oblong-convex, more glossy and less costulate below, elegantly lamellose above, unisulcate at the periphery, sulcus thread-like, slightly projecting, glossy, nearly smooth, but nevertheless subnodulose under a lens, and extending to the aperture. Aperture suboblique, long-oblong, narrow, angular above and below, regularly convex outwardly, wine-colored within. Peristome unexpanded, acute. Columellar margin paler, somewhat amber-colored, straight, obliquely truncate at the base. Parietal callous thin and diaphanous. Length 40, diam. 16 mm.; aperture 16 mm. long, 7 wide (*Bgt.*).

East Africa: Nguru Mts., between Ukamba and Ussagora, at 1800-2000 meters elev. (Missionary A. Leroy) ; Buloa near Tanga (Eismann).

Stenogyra leroyi Bgt. Moll. Afr. Equat. p. 110, pl. 6, f. 11 (1889).—*Pseudoglessula leroyi* Marts. Beschalte Weichthiere p. 115. fig. (dentition).

The specimen taken by Eismann measures 37.5 mm. long, 11.5 wide, aperture 15.5 long. The dentition is roughly figured by Prof. von Martens. The central tooth is narrow, with a single cusp, the adjacent lateral is bicuspid, the ectocone small.

17. P. subcarinifera (Smith). Pl. 61, fig. 95.

Shell elongate, acuminate above, imperforate, glossy, olivaceous-brown. Whorl 7, the first turned in, next two convex, ornamented with oblique curved and rather wide-spaced ribs, the rest of the whorls convex, with more delicate, very close ribs; separated by a slightly oblique, deep suture; the last whorl oblong, encircled with an indistinct elevated line about the middle. Spire produced, obtuse at the apex. Aperture irregularly piriform, about one-third the total length; lip thin, very narrowly expanded anteriorly; columella whitish, arcuate in the middle, obliquely truncate below, sinuate below the truncation. Length 16, diam. 7.5, aperture 6⅓ mm. long, 4 wide (*Smith*).

East Africa: On the plains within 50 miles of Mamboya; also at an elevation of 4000 to 5000 ft. (Last).

Stenogyra (*Subulina*) *subcarinifera* Smith, Ann. and Mag. Nat. Hist. (6), vi, p. 157 (Aug., 1890).—*Pseudoglessula s.*, Martens Beschalte Weichthiere, p. 115.—*Homorus* (*Pseudoglessula*) *carinifera* Smith, Kobelt, Conchyl. Cab. p. 113. —*P. subvaricifera* Marts., *t. c.* p. 114, in text.

Var. *major*. Shell paler, with 8 whorls, the second and third having more numerous ribs than in the typical form. Length 18, diam. 8.5 mm.; aperture 7 mm. long, 4.5 wide (*Smith*).

18. P. introversa (Smith). Pl. 61, fig. 94.

Shell elongate, acuminate above, narrowly rimate, hardly shining, thin, greenish-corneous. Apex turned downwards; whorls 7, the first two or three rather strongly costulate, the rest rather convex, obliquely striate, the last whorl encircled with an obsolete keel around the middle. Aperture ovate, slightly exceeding one-third the total length; peristome thin, the columellar margin rather widely dilated, reflexed over the umbilical crevice, and towards the base obliquely subtruncate or plicate within. Length 16, diam. 7 mm., aperture 6 mm. long, 4 wide (*Smith*).

East Africa: Mamboya, at an elevation of 4000 to 5000 ft. (Last).

Bulimus (*Cerastus ?*) *introversus* SMITH Ann. and Mag. N. H. (6), vi, p. 155, pl. 5, f. 11.—*Pseudoglessula introversa* MARTENS, Beschalte Weichthiere p. 116.

"The resemblance in form and the faint raised line around the body-whorl recall to mind the typical form of *Subulina subcarinifera*. That species is imperforate, much more coarsely sculptured and has a more distinctly truncate columella. The apex in both forms is similarly introverted" (*Smith*).

19. P. CONRADTI Martens. Pl. 61, fig. 99.

Shell rimate, somewhat turrited, with close weak rib-striæ; horn-brown; 7 whorls, the riblets stronger and more spaced on the second; the following whorls increase regularly in width and are weakly convex. Last whorl elliptical, with a scarcely noticeable keel in the middle, rounded below. Aperture but slightly oblique, obliquely trapezoidal, with unexpanded somewhat thick peristome. Outer lip weakly arcuate; lower margin nearly horizontal. Columellar margin nearly vertical, moderately expanded and reflexed, not covering the umbilical chink, very weakly obliquely truncate at the base. Length 14, diam. 6 mm., the aperture 5.33 mm. long, with the peristome 4 wide, without it 3 mm. (*Marts.*).

East Africa: Ussambara (Conradt).

Pseudoglessula conradti MARTS., Nachrbl. D. M. Ges. 1895, p. 184; Beschalte Weichthiere p. 116, pl. 5, f. 13.

This peculiar species stands intermediate between *Pseu-*

doglessula and *Buliminus*. The almost lusterless earthy-brown color, the open umbilical chink, with widely reflexed, flattened columellar margin, which passes almost unbrokenly into the rounded basal margin, speak at first glance for *Buliminus;* but the strong, rather sparse ribs at the apex, with a somewhat obliquely set first whorl are quite as in *Pseudoglessula*. The trace of a keel on the last whorl and the inward oblique truncation of the columella also recall *Pseudoglessula*. (*Marts.*)

Buliminus stuhlmanni Marts. has the same apical sculpture and may belong also to *Pseudoglessula*.

Genus CHILONOPSIS F. de Waldheim.

Chilonopsis FISCHER de WALDHEIM, Bulletin de la Société Impériale des Naturalistes de Moscou, xxi, 1848, p. 236, for *C. sulcata* Fischer de W.—*Bulimus, Bulimulus, Pachyotus,* etc., of authors.

The shell is imperforate or rimate, ovate or oblong, composed of 6½ to 9 whorls. Aperture subvertical, irregularly ovate, occupying less than half the shell's length; outer lip simple, expanded or thickened; columella obliquely truncate at the base. Coloration, when preserved, of whitish oblique, interlacing marks or subsutural spots on a dark ground.

Jaw (of *C. melanioides,* pl. 62, fig. 20) is arcuate, very closely and finely striated.

The radula (of *C. melanioides,* pl. 62, fig. 21) has the formula 16, 11, 1, 11, 16. The transverse rows of teeth are straight in the central and lateral areas, but curve strongly forward in the marginal areas. The central tooth is narrow, with a single well developed cusp. The laterals have strong mesocone and ectocone, but no entocones. The eleventh and twelfth teeth are transitional. The marginals have the ectocone split, and on the outer teeth both cusps are split and, producing a serrate edge, as shown in the figure.

Egg-capsules of moderately large size, with a calcareous shell, as in *Achatina*. These of *C. nonpareil* measure 6½ x 6 mm.

Type, *Chilonopsis nonpareil* (Perry).

Distribution: Island of St. Helena. Two species, *C. melanioides* and *C. turtoni* still exist in exceedingly restricted areas, where the old island flora is in part preserved; the others are extinct.

The species are illustrated on Plate 52.

Chilonopsis was referred to the *Achatina* family by Fischer in 1883, but that position was first demonstrated by the writer in 1896, by the examination of the jaw and radula of *C. melanioides* (Proc. Acad. N. S. Phila. 1896, p. 418, footnote 9). Dall first associated the small, thin Bulimuloid forms with the large, solid *C. aurisvulpina* (*nonpareil*), a grouping justified by the conchological characters of the species, which however are remarkably varied in contour, texture and sculpture. A similar diversity of contour is already familiar among species of other generic groups. The Peruvian or Lower Californian Bulimuli, the Philippine Helicostylas, the Eulotas, and many other genera will immediately be recalled in this connection.

Among continental genera, *Chilonopsis* is apparently most nearly related to *Pseudoglessula, Subulona, Trichodina* and their allies. All of them have a more or less truncate columella, crenate suture and in the less specialized species, a long, turrited shape. In some forms the sutural crenation has been outgrown and the general shape changed; but as a whole they are more primitive than the genera of large African *Achatinidæ*. The common ancestors of all these groups date back to or nearly to the time preceding the Atlantic when Africa and South America were united and supported a common Cretaceous fauna of *Achatinidæ, Streptaxidæ, Megaspiridæ*, etc. and fresh-water mollusks; but there is, so far as I know, no trace of an exclusively South American faunal element in the St. Helena biota.

Characteristics of the St. Helena Snail-fauna. Dall has drawn a parallel between the St. Helena and the Galapagos snail faunas, tracing their peculiarities of shell sculpture and texture to the influence of an environment subject to long arid periods. It is doubtful whether this theory is borne out by the facts. St. Helena was densely forested when

C. aurisvulpina and most of the other species existed, and there is every reason to believe that the snail fauna was wholly unaffected by deficient or irregular water supply. The shells had not the coloration of arid-country snails. *C. aurisvulpina* is a markedly phylogerontic form, and was probably nearing extinction when the catastrophy was precipitated by the deforesting of the island. The sculptural peculiarities of the others are easily paralleled in forms inhabiting notably humid regions such as St. Thomé, Cameroons, etc.

St. Helena exhibits two common characteristics of almost all old island-faunas: (1) a very small number of original generic types, in this case about six, some one or two of which have been greatly modified to fill stations commonly occupied by species of several genera. *Cf. Pœcilozonites* in Bermuda; *Mandarina* and *Hirasea* in the Bonin Is.; *Achatinellidæ* in the Hawaiian group; (2) accelerated aging of the genera so modified, resulting in unusually large forms variously calloused or irregularly coiled, being often unduly elevated or depressed for their genera,—stigmata of old age of the group. This results in an unusual proportion of extinct species, especially if the equilibrium of the fauna be in any way disturbed; and the forms which drop out are as a rule, those with phylogerontic characters. *Cf.* in Bermuda, *Pœcilozonites nelsoni, cupula, zonata;* in the Bonins, *Mandarina ruschenbergeriana, pallasiana;* in the Madeiras, *Geomitra delphinula, bowdichiana, Leptaxis lowei,* etc. In New Caledonia the most ponderous and heavily calloused Placostyles. The list could be greatly extended.

It seems therefore that the characteristics of the St. Helena snail fauna are those of an ancient, isolated fauna, rather than traceable to aridity of climate.

NOMENCLATURE. The name *Pachyotus* has been used for *C. aurisvulpina* by most authors, in either a generic or subgeneric sense. That name was proposed by Beck in 1837 for a series of Brazilian forms and the species *B. aurisvulpina,* no type being selected. Herrmannsen, in September, 1847, selected the Brazilian species *Bulimus melanostomus* as type, thus making *Pachyotus* a synonym of *Auris* Spix. See

Manual X, pp. 95, 97. Later in the same year Gray nominated *aurisvulpina* as type, but his action, forestalled by Herrmannsen, is void.

LITERATURE. Monographic accounts of the species of *Chilonopsis* (under various generic names) have been published by T. Vernon Wollaston, Testacea Atlantica, pp. 542-552 (1878), and by E. A. Smith, On the Land-shells of St. Helena, in Proc. Zool. Soc. London, 1892, pp. 258-270.

Key to Species of Chilonopsis.

1. Whorls with a series of folds or bosses below the suture (*Chilonopsis* s. str.).
   - *a.* Shell large and very solid; ovate, the diam. about half the alt.; outer lip heavily calloused. *C. nonpareil,* no. 1.
   - *aa.* Shell small and thin; slender, the diam. much less than half the alt.; outer lip not calloused.
     - *b.* Spire straightly conic; sutures deep; 8 to 9 whorls. *C. melanioides,* no. 2.
     - *bb.* Spire with convex outlines; whorls 6½ to 7. *C. subplicatus,* no. 3.
2. Thin; whorls 6½ to 7, smooth below the suture (*Cleostyla*).
   - *a.* Long-ovate, with the lip somewhat dilated below and the columella slightly truncate; 28 to 31.5 mm. long. *C. subtruncatus,* no. 4.
   - *aa.* Oblong, the lip somewhat dilated below, the columella very strongly truncate; about 20 x 8 mm. *C. exulatus,* no. 5.
   - *aaa.* Ovate-conic, very thin, usually maculate or striped with whitish on a brown ground; outer lip simple, acute. Columella somewhat truncate; about 17 x 7.5 mm. *C. turtoni,* no. 6.

1. C. NONPAREIL (Perry). Pl. 52, figs. 46 to 51.

Shell imperforate or compressed-umbilicate, solid and heavy, ovate. Whorls nearly 7, convex and slowly increasing. The first half whorl is smooth, the rest are convex, deeply, coarsely plicate below the suture. At the end of the first whorl some low spiral cords appear, continuing to the end, becoming coarser progressively. The last whorl is swollen below the suture, frequently carinate there. The aperture is ear-shaped, subvertical, the opening narrow at both ends, wide in the middle. The lip is reflexed, very much thickened on the face and internally, orange-red in the freshest specimens. Columella vertical, obliquely subtruncate within, thick and reflexed, red. Parietal callous thick, orange-red, usually with a low, obtuse callous lump in the middle.

Length 47, diam. 28 mm.
Length 44, diam. 23 mm.
Length 35, diam. 19 mm.

St. Helena: all along Sugarloaf Ridge (Turton); between Sugarloaf and Flagstaff (Wollaston), at about 1400 to 1700 ft. above sea level. Extinct.

Auris vulpina CHEMNITZ, Conchyl. Cab., xi, p. 287, pl. 210, f. 2086, 2087 (not binomial).—*Voluta auris vulpina* DILLWYN, Descript. Catal. i, p. 503 (1817).—*Helix auris vulpina* Fér., Prodr. p. 57, no. 445.—*Pupa auris vulpina* GRAY, Ann. of Philos. n. s., ix, p. 413.—*Bulimus auris vulpina* DESH. in Lann., An. s. Vert. viii, p. 257.—GRIFFITH in Cuv., Anim. Kingdom, pl. 37, f. 7.—KUSTER, Conch. Cab. p. 39, pl. 8, f. 5, 6.—PFR., Monogr. ii, 93, 534; iii, 371; iv, 440; vi, 77; Conch. Cab. pp. xiii, 39, pl. 21, f. 14, 15 (small variety).—REEVE, Conch. Icon. v, pl. 30, f. 180.—CROSSE, Journ. de Conch. xx, 1872, p. 270 (fresh specimen).—SMITH, P. Z. S. 1892, p. 265, pl. 22, f. 11-11*e* (includes *darwinianus*).—WOLLASTON, Testac. Atl., p. 547, with var. *subspiralis* and *obliteratus* (1878).—*Buliminus* (*Pachyotus*) *auris vulpina* Chemn., KOBELT, Conch. Cab. p. 656, pl. 98, f. 3-8.—*Cochlogena auris-vulpina* De Fer., SOWB., Appendix to Darwin's Obs. on Volcanic Is., p. 155.—*Pachyotus auris-vulpina* DALL, Proc. A. N. S. Phila. 1896, p. 418.—*Melania nonpareil* PERRY, Conchology, pl. 29, f. 4 (1811).—*Pachyotus alopecotis* BECK, Index, p. 56.—*Struthiolaria crenulata* LAMARCK, An. s. Vert. vii, p. 148 (1822).—*Bulimus struthiolaris* MENKE, Zeitschr. f. Malak. 1844, p. 30.—*Chilonopsis sulcata* FISCHER de WALD-

HEIM, Bull. Soc. Imp. des Naturalistes de Moscou, xxi, 1848, p. 236, pl. 3, f. 1, 2, reproduced in J. de Conch. 1, 1850, p. 87, pl. 4, f. 6.

Bulimus darvinianus FORBES, Journ. Geol. Soc. London, viii, p. 198, pl. 5, f. 1 (1852).—*Bulimus darwinianus* WOLL., Testac. Atl. p. 549.

Bulimus auris-muris SHUTTLEWORTH, Diagn. n. Moll. (p. 20), in Mittheil. Naturforsch. Gesellsch. in Bern, 1852, p. 200, =*Bulimus auris-myoxi* SHUTTLW., *t. c.*, p. 289, =*Bulimus myoxus* SHUTTLW.

Mr. Smith writes as follows of the specimens collected by Captain Turton: "The freshest examples are of a light reddish color and generally of a somewhat darker tint towards the apex. The top of the plications at the suture are whitish, and there is more or less of this color variously distributed over the surface in the form of irregular streaks and blotches. A few subfossil snails' eggs obtained at Sugarloaf Ridge along with this species evidently from their size belong to it. They are roundly ovate, being 6½ mm. in length and 6 broad. Some other much smaller eggs were also found by Captain Turton at the same place, but in this instance it would be mere guesswork to suggest to which species they belong."

This largest species of the genus has some resemblance to certain forms of the Bulimulid genera *Placostylus* and *Auris*, though with no relationship whatever to either. The neanic sculpture has extended upon the embryonic whorls, beginning on the later half of the first one, being thus more accelerated than in the other species. The heavy, irregular callouses of the aperture of the normal adult *C. nonpareil* are a character of old age. The species is thus markedly phylogerontic. It is extremely variable, different parts of Sugarloaf Ridge having different varieties, according to Captain Turton. The following varieties have received names:

1*a*. Var. *subspiralis* Woll. Covered rimate, the whorls less striated longitudinally, but obsoletely, obtusely spirally costate. Parietal callous far within, in the middle tubercular-swollen.

1*b*. Var. *obliteratus* Woll. Covered rimate; whorls more obsoletely biangulate below the suture; peristome less thickened, the right margin nearly simple, scarcely thickened within. Parietal callous far within, in the middle slightly swollen.

1*c*. Var. *darvinianus* Forbes (pl. 52, figs. 50, 51). Narrower, smaller and more fusiform than *C. nonpareil*, less roughened, with the suture more oblique. Parietal tubercle developed. Umbilicus closed. Found in company with *C. nonpareil*, imbedded in the ridge-like slopes of indurated soil in the vicinity of Flagstaff, Sugarloaf and the Barn.

The original figure of *Chilonopsis sulcata* indicates at least a peculiarly senile stage of development, and if it is accurate, perhaps even a distinct species or subspecies of the group. The description follows:

Chilonopsis. Shell turrite, with 6 convex spirals; umbilicate; aperture long, narrow, of unequal width, columella strongly dilated, sinuate below and inwardly, margined outwardly, base forming a canal with the swollen, outwardly triplicate right lip.

C. sulcata (pl. 62, fig. 25, 27). Turrited, seven-whorled, the whorls convex, longitudinally sulcate. Alt. 6 millim.; diam. of the first whorl 30 millim. Hab. in St. Jago, South America.

2. C. MELANIOIDES (Wollaston). Pl. 52, fig. 53.

Shell long and rather narrow, turrite-conic; narrowly, nearly covered perforate; black-brown, sometimes reddish, marked with irregular, usually confluent ochraceous streaks; very closely longitudinally costulate-striate, subopaque. Whorls 8 to 9, a little convex, separated by a very deep, somewhat wavy suture, obliquely, strongly and rather distantly plicate below the suture, the last whorl obtusely angular at the periphery, less strongly striate below. Aperture narrowly ovate; outer lip simple and thin. Columella obliquely truncate below, and bearing an oblique fold above; parietal callous a very thin film.

Length 9-11, diam. 3.5, aperture 3.5 lines (*Woll.*).

Length 16, diam. 6 mm., whorls 7½.

St. Helena; Northern slopes of the ridge below Diana's Peak, at the roots of grass in damp places (*Wollaston*).

Subulina melanioides WOLL., Testacea Atlantica p. 550 (1878).—*Bulimulus m.*, SMITH, P. Z. S. 1892, p. 267, pl. 22, f. 18.—*Pachyotus melanioides* DALL, Proc. A. N. S. P., 1896, pp. 416, 419.—PILSBRY, *t. c.* p. 418, footnote (teeth and jaw figured).

In this species the first half whorl appears to be smooth; then spiral striæ faintly appear. The second whorl has coarse rib-striæ crossed by some spirals. The oblique nodules appear at the beginning of the third whorl. On the later whorls the spirals become weak or obsolete, except the peripheral angle. It is a decidedly less evolved species than *C. nonpareil,* in which the sculptural characters are more accelerated. Dall's conjecture that the latter arose from some such form as *C. melanioides* seems well founded. I have figured the jaw and teeth of this species, from a dry specimen.

3. C. SUBPLICATUS (Sowerby). Pl. 52, figs. 55, 56.

Shell narrowly rimate, long and slender, rather thin; reddish brown, paler at the suture and base, or bleached to a gray tint, elaborately mottled and striped with opaque white. Outlines of spire convex, the apex obtuse. Whorls 6½ to 7, slightly convex. The first 2 whorls are smooth and convex. The following whorls are densely striated longitudinally, the striæ somewhat wavy; and at first there are some indistinct spirals. Rounded nolule-like folds below the suture appear weakly on the third whorl, increase in size, becoming largest on the intermediate whorls, and diminish on the last whorl, where they are absent for some distance. The last whorl is oblong and usually shows indistinct traces of a peripheral angle. Aperture fusiform-oval, narrowed towards both ends. The outer lip is simple and obtuse, not thickened; columellar margin dilated, continued above in a thin parietal callous. Columella obliquely truncate at the base, concave in the middle.

Length 15.5, diam. 5.3 mm.; aperture 6 mm.

Length 14, diam. 5 mm.; aperture 5.6 mm.

St. Helena: fossil in a cutting through surface soil on the Sidepath, between Jamestown and Longwood, on the side of the hill overlooking the Briars (Wollaston); Sugarloaf Ridge, common (Turton).

Cochlicopa subplicata Sowb. in Darwin's Geological Observations on the Volcanic Islands, etc., Appendix, p. 156 (1844).—*Bulimus subplicatus* Sowerby, Forbes, Quart. Journ. Geol. Soc. Lond. viii, 1852, p. 199, pl. 5, f. 6.—*Subulina subplicata* Woll., Testac. Atlant. p. 552.—*Bulimulus* (*Peronæus ?*) *subplicatus* (Sowerby), Smith, P. Z. S. Lond. 1892, p. 266, pl. 22, f. 15.—*Pachyotus s.*, Dall, Proc. A. N. S. P. 1896, p. 419.—*Cochlicopa terebellum* Sowb., *t. c.* p. 156.—*Bulimus t.*, Forbes *t. c.* p. 199, pl. 5, f. 5.—*Subulina t.*, Wollaston, *t. c.* p. 552.

Var. *terebellum* Sowerby. (Pl. 52, fig. 52). "Shell oblong, cylindric-pyramidal, the apex rather obtuse; whorls 7, smooth; suture posteriorly crenulate. Aperture oval, acute posteriorly, the outer lip thin, sloping in front. Columella obsoletely truncate, umbilicus small. Length .77, diam. .25 inch. This species differs from the last [*subplicatus*] in being more cylindrical and in being nearly free when full grown from the obtuse folds of the posterior volutions, as well as the form of the aperture. The young shells of this species are longitudinally striated, and they have some very obsolete folds" (*Sowb.*).

This is evidently a form of *C. subplicatus.* The original description is given, and a copy of Forbes' figure of the type, collected by Darwin.

Subgenus Cleostyla Dall, 1896.

Proc. A. N. S. Phila. 1896, p. 419, in text.

The oval or oblong shell is thin, smoothish, *not plicate below the suture;* the outer lip is thin and somewhat expanded below. The smooth apical whorls form a slightly mamillar summit. Type *C. exulatus* Bens.

While without bosses below the suture, *C. exulatus* has white spots, corresponding to those upon the bosses in *C. melanioides* and *subplicatus.*

4. C. SUBTRUNCATUS (E. A. Smith). Pl. 52, fig. 54.

Shell subfossil, long ovate, acuminate above, imperforate, striated with delicate, oblique growth-lines. Whorls 7, a little convex, separated by a somewhat deep suture, the last whorl obliquely sloping, but slightly ascending to the lip. Aperture inversely ear-shaped, hardly half the length of the shell; lip thin, slightly spreading or expanded in front. Columella oblique, rather straight, connecting with the outer lip by a thin callous above; anteriorly more or less subtruncate. Length 31.5, diam. 12.5 mm., aperture 14 mm. long, 7 wide (*Smith*).

Length 28, diam. 11.5 mm., length of aperture 13 mm.

St. Helena: Side Path, common (Turton). Extinct.

Bulimulus subtruncatus E. A. SMITH, Proc. Zool. Soc. London 1892, p. 266, pl. 22, f. 14.—*B.* (*Cleostyla*) *subtruncatus* Sm., DALL, Proc. A. N. S. Phila., 1896, p. 419.

This species is larger than *C. exulatus,* more fusiform, with the columella far less distinctly truncate. It apparently had the same type of coloring,—oblique, often intersecting opaque-white markings, for some specimens are corroded in that pattern.

5. C. EXULATUS ('Benson' Rve.). Pl. 52, figs. 57, 58.

Shell oblong, imperforate, rather thin, gray-white, profusely marked with a tracery of opaque white. Spire subcylindric, terminating in a rather slender cone. Whorls 6½, the first 4 convex and slowly widening, the rest very rapidly widening and less convex; suture simple, impressed. Sculpture of fine wrinkles along growth-lines, a little stronger on the intermediate whorls, where they are more or less distinctly cut by spirals. The aperture is acutely ovate, subvertical. The outer lip though thin is obtuse at the edge; outer and basal margins noticeably flaring. Columella short, prominent and truncate at the base, and bearing a low, very deeply placed fold above.

Length 20, diam. 8, aperture 9 mm.

St. Helena: Sugarloaf Ridge, common (*Turton*). Extinct.

Achatina exulata Benson MS., REEVE, Conch. Icon. v, text of plate xxi, no. 77 (March, 1850); *Bulimus*, pl. 78, f. 572. —*Bulimus exulatus* WOLL., Testac. Atlant. p. 542.—*Bulimulus exulatus* SMITH, P. Z. S. 1892, p. 266, pl. 22, f. 16.— *B.* (*Cleostyla*) *exulatus* Bens., DALL, Proc. A. N. S. Phila. 1896, p. 419.

A somewhat cylindric shell, with conic, slightly nipple-like summit, and strongly truncate columella.

6. C. TURTONI (E. A. Smith). Pl. 52, figs. 59, 60.

Shell narrowly perforate, ovate-conic, *very thin,* glossy; brownish-corneous, painted longitudinally with irregular opaque-white streaks. Whorls 7, a little convex, striated with oblique growth-lines, the last whorl rounded at the periphery (obsoletely angular in young shells), the apex subpapillar. Aperture ovate, acuminate above, hardly half the total length of the shell; peristome very thin, the outer margin simple, scarcely expanded, columellar margin narrowly reflexed above the umbilicus, delicately calloused, provided with a small fold or denticle in the middle. Length 17, diam. 7.75 mm., aperture 7.75 mm. long, 4 wide (*Smith*).

St. Helena: High Peak, among native vegetation (Turton).

Bulimulus turtoni SMITH, P. Z. S. 1892, p. 266, pl. 22, f. 17, 17*a*.

The thin texture, shape and coloration of this snail remind one of the arboreal *Drymæus,* some species of which are not dissimilar. The axis is rather large and hollow. The columella, in adults, bears a short, oblique callous superposed upon the cylinder near its base (pl. 52, fig. 60), much as in *C. exulatus*. Mr. Smith writes as follows:

"The substance of the shell is extremely thin and fragile and the surface exhibits no other sculpture excepting lines of growth. The color ornamentation is variable. In what may be regarded as the typical form the opaque creamy longitudinal markings take the form of broadish irregular wavy stripes, which frequently run into one another, so that they exhibit a more or less zigzag appearance. In other specimens these broadish stripes are replaced by very numerous and slender lines, which are more or less wavy and sometimes considerably interrupted and broken up.''

Genus TRICHODINA Ancey, 1888.

Trichodina Ancey, Bull. Soc. Malac. France v, p. 71, footnote 6, for ''Trichodina marmorea Reeve (=barbigera Morelet)'' (1888).

Shell imperforate, solid, turrited-conic, the summit conic, not in the least mamillate; the apex minute, whorls rapidly enlarging, flattened, often ribbed. Adult sculpture various. Aperture small, Achatinoid, the columella truncate. Soft anatomy unknown.

Types *T. marmorea* (Rve.) and *barbigera* (Morel.). Distribution, Islands in the Gulf of Guinea; and the Comoro Is., in the Indian Ocean.

This group differs radically from *Pseudoglessula, Homorus* and their allies in the structure of the early whorls, indicating a decided diversity in the young stages of the animals. *Homorus* and *Pseudoglessula* have a pupoid or cylindric shell in the late embryonic and early neanic stages, while *Trichodina* and *Bocageia* have a trochoid shell.

The species from the Comoro Islands are extremely similar to those of the West African Islands, although separated by the width of the entire continent.

The species are arranged as follows:

I. Columella distinctly truncate, Achatinoid (*Trichodina*).
  a. Species of West African islands, sp. no. 1 to 6.
  b. Species of East African islands, sp. no. 7 to 10.
II. Columellar truncation obsolete (*Bocageia*).
  a. Prince's Island, species no. 11.

Species of West African Islands.

1. T. marmorea (Reeve). Pl. 55, figs. 96, 94, 95.

Shell elongately turrited, narrow, somewhat cylindrical, rather solid; whorls flatly convex, obliquely rather rudely striated; columella thinly truncated; aperture small. White, covered with a chestnut-horny epidermis (*Reeve*).

Habitat unknown (Mus. Taylor).

Achatina marmorea REEVE, Conch. Icon. v, pl. 23, f. 125 (March, 1850).—PFR., Monogr. iii, p. 499.

Morelet considered Reeve's type of *marmorea* to be a worn specimen of his own *A. barbigera;* a conclusion which seems to me well founded. The description of the latter follows:

A. barbigera Morelet (Pl. 55, figs. 94, 95). Shell club-shaped turrited, solid, opaque, white, longitudinally plicate-costulate, covered with a dark chestnut, membranously filamentose cuticle with spiral ridges bearing scale-like fringes. Spire long, acute, the suture impressed. Whorls 9, plano-convex, the last obsoletely angulate at the base, one-fourth the length of the shell. Columella arcuate, pale, tapering truncate. Aperture small, semioval, blue within; peristome simple, unexpanded. Length 43, diam. 12 mm. (*Morel.*).

Island of S. Thome: Forests of Mt. Café etc., at 400 to 1450 meters elevation.

Achatina barbigera MOREL., Journ. de Conch. xiv, 1866, p. 160; Voy. Welwitsch p. 75, pl. 9, f. 5.—CROSSE, J. de C. 1868, p. 134.—PFR., Monogr. vi, p. 234.—*Homorus barbiger* CROSSE, J. de C. 1888, p. 21.—GIRARD, Jornal de Sci. Math. Phys. e Nat., Lisboa, (2), iii, p. 41 (1893).—KOBELT, Conch. Cab. p. 98, pl. 26, f. 7, 8.

This species is very variable in the length of the spire and the convexity of the whorls, according to Mr. Girard. At Portinho Mr. Newton found two fresh sinistral specimens; and among 26 worn examples found on the beach at Bua Bua, washed down from the high land, there were 10 sinistral ones. The largest specimen of *barbiger* collected by Mr. Newton measured 50 mm. long, 15 wide.

The shell, Morelet writes, is quite thick, corneous, whitish, grooved with oblique, flexuous pliciform riblets not very regular in appearance, and less apparent when the shell is covered with its epidermis. This epidermis is of a deep chestnut color and fibrous texture. It is finely striated longitudinally, but what makes it remarkable are the regularly spaced, fine spiral lines set with short, straight hairs. Specimens in drying etc. very readily lose the hairs and cuticular spiral riblets.

2. T. MASSONIANA (Crosse). Pl. 56, figs. 13, 14, 15.

Shell imperforate, long-turrite, moderately thick, rather solid; longitudinally, slightly obliquely wrinkle-striate, dirty white under a nearly lusterless somewhat deciduous chestnut-brown epidermis. Spire long, the apex rounded, obtuse; suture impressed. Whorls 8, a little convex, flattened, the embryonic 1½ nearly smooth, without epidermis and of a dirty white; last whorl very much shorter than the rest of the spire, very obtusely, almost imperceptibly subangular in the middle, tapering downwards. Aperture oval-piriform, dirty white inside. Peristome simple, the margins united in adult individuals by a brownish callous deposit in the form of a projecting cord, which extends along the outer margin of the columella. The latter is quite projecting, arcuate, and truncate just short of the base. The basal and outer margins are thin and almost acute. Length 36.5, diam. 13 mm.; aperture 11 mm. long, 7 wide (*Crosse*).

San Thome (Masson).

Homorus massonianus CROSSE, Journ. de Conchyl., xxxvi, 1888, p. 22.—*Achatina* (*Homorus*) *massoniana* CROSSE, *t. c.*, pl. 1, f. 3.—*H. massonianus* KOBELT, Conchyl. Cab., p. 99, pl. 27, f. 2, 3 (copy from Crosse).

While very closely related to *T. barbigera*, this species differs by the wider, subangular last whorl and the raised, cord-like and usually crenulate or beaded parietal callous. It may however be merely a wide variety of that species. Traces of about 6 spiral ridges are visible in well-preserved specimens, and there is little doubt that fresh shells have cuticular fringes. The peculiar sculpture of waved striæ is shown in fig. 15. A specimen measures 37 mm. long, 13.6 wide.

3. T. CLAVUS (Pfeiffer). Pl. 56, figs. 9, 10, 11.

Shell oblong-turrited, rather solid, obliquely closely striate; tawny, the base darker; spire turrited, the apex acute.

Whorls 9½, rather flat, the last less than one-third the total length; columella very arcuate, obliquely truncate. Aperture oblong-oval, dirty whitish inside; peristome simple. Length 33, diam. 10 mm.; aperture 11 mm. long, 5.5 wide (*Pfr.*).

S. Thome: stony slopes at 2500 ft. alt. and the coffee plantations 500 ft. lower (Welwitsch); Monte Cafe (Greef et Castro); almost the whole island, between 200 and 1400 meters alt.

Achatina clavus PFR., Symbolæ iii, p. 20 (1846); Monogr. ii, p. 260.—REEVE, Conch. Icon. v, pl. 16, f. 75 (1849).—MORELET, Voy. Welwitsch, p. 76.—*Homorus clavus* Girard, Jornal de Sci. Math. Phys. e Nat., Acad. Real Sci. Lisboa, (2), iii, p. 95 (1893).—KOBELT, Conchyl. Cab. p. 97, pl. 26, f. 5, 6.

According to Girard, this is the commonest *Homorus* on S. Thome, reported from the shore up to 1400 meters. Like *H. barbiger,* it presents several varieties of form and convexity of the whorls, and the color varies from light yellow to brown, the general tint being intensified on the last whorl.

The apex is conic, acute, the early whorls being closely sculptured with fine curved riblets. The later whorls are densely striate, with slight traces of decussation. The striæ are stronger and curved below the suture. The aperture is quite oblique. Fig. 11 represents Pfeiffer's type, after Reeve. Figs. 9, 10 are drawn from a paler specimen measuring 32 mm. long, 9 wide.

Pfeiffer in the *Monographia* iv, p. 608, has included an *Achatina inflecta* Gld., from Liberia, in the Luders collection, as a synonym of *clavus.* Girard, with good reason, states that confirmation of the continental occurrence of *H. clavus* is still wanting.

4. T. ARATISPIRA Pilsbry, n. sp. Pl. 56, figs. 16, 17.

Shell olivaceous-yellow with the spire fading to whitish above, rather thin but solid, glossy. Whorls 6½, the first half whorl smooth, glossy, projecting and minute, the following whorls flattened, slightly convex, all but the last two closely, regularly costulate; the riblets gradually diminishing, subobsolete on the last whorl, which is merely irregularly striate, with coarse arcuate folds below the suture. Last whorl angular at the periphery. Aperture oblique, acuminate-ovate; outer lip thin and acute; columella very concave, abruptly truncate below. Length 21, diam. 9 mm.; aperture 9 mm. long.

West Africa: Liberia (?).

This snail is similar to *T. clavus* except for its very much coarser, stronger sculpture. The authority for the locality on the label is unknown.

5. T. PAXILLUS (Reeve). Pl. 56. fig. 12.

Shell subulate, subfusiform, rather solid, obliquely minutely striated, whitish, covered with a thin corneous buff-olivaceous cuticle. Spire convex-turrited, the apex acute. Whorls 9, the upper flat, the rest more convex, the last scarcely one-third the total length, rounded basally. Columella subvertical, callous, twisted. Aperture oblique, elliptical-oval; peristome simple, unexpanded, acute. Length 27, diam. 9 mm.; aperture 9 mm. long. 4.5 wide (*Pfr.*).

Habitat unknown (Mus. Cuming).

Achatina paxillus REEVE, Conch. Icon. v, pl. 16, f. 78 (May, 1849.)—PFR., Monogr. iii, p. 498.

"This is rather a stout shell, peculiarly rounded at the base. In other respects it approaches very closely to *A. clavus*" (*Rve.*). It may prove to be a variety of *clavus*.

6. T. MONTICOLA (Morelet). Pl. 56, figs. 4, 5, 6, 7, 8.

Shell elongate-turrite, thin, very glossy, longitudinally plicate costulate, covered with a straw-colored cuticle. Spire lengthened, the apex somewhat obtuse; suture impressed, crenulated by the prominent riblets. Whorls 8 to 8½, but slightly convex, the last a little ventricose, obscurely angular below the middle, slightly exceeding one-third the total length. Columella somewhat twisted, obliquely truncate, not reaching to the base. Aperture semioval; peristome unexpanded, simple and thin. Length 17, diam. 6 mm. (*Morelet*).

Island of S. Thome: in moss on the higher points (Welwitsch).

Achatina monticola MOREL., Journ. de Conchyl. 1866, p. 160; Voy. Welwitsch p. 77, pl. 5, f. 7.—CROSSE, Journ. de Conch., 1868, p. 135.—PFR., Monogr., vi, 1868, p. 231.—*Homorus m.*, GIRARD, Jornal de Sci. Math. Phys. e Nat. Lisboa, (2), iii, p. 96, pl. 1, f. 5-8 (1893).—*Achatina* (*Subulina*) *subcrenata* GREEF, Zool. Anzeiger 1882, p. 519.—*Homorus subcrenulata* CROSSE, J. de C. 1888, p. 25.—*H.* (*Pseudoglessula*) *monticola* KOB., C. Cab. p. 107.

The above description from Morelet was based upon immature specimens. Girard has made a careful study of very numerous specimens collected by F. Newton, who found it in numerous places, nearly always under stones. There are many more or less differentiated local races, the following being described by Girard. The first description applies to the adult form of typical *monticola*, of which *subcrenata* Greef is a synonym.

a. Pl. 56, fig. 5. Shell imperforate, elongate, turriculate, thin, glossy, of a light yellow color; with slightly oblique, irregular, more or less pronounced growth-striæ, projecting at the suture, finer and less marked on the last whorl. Spire composed of 12 slightly convex whorls, with a deep suture and terminating in a rounded summit. Embryonic whorls 2, nearly smooth, or finely striate. Last whorl contained about 4½ times in the total length, rounded. Aperture oval, elongate; peristome simple, sharp, the margins united by a very distinct deposit. Columellar margin arcuate, very obliquely truncate before reaching the base. Length 35, diam. 8 mm.; aperture 8.5 mm. long, 4.5 wide (*Girard*).

b. Pl. 56, fig. 6. Less lengthened, the striæ indistinct except at the sutures; last whorl contained 3½ times in the total length.

c. Pl. 56, fig. 8. Very much lengthened, very glossy, the striæ indistinct except at the suture; last whorl contained 5 times in the total length; whorls plano-convex.

d. Var. *costulata* Greef. Pl. 56, fig. 7. Suture very deep; striæ irregular and very prominent.

Achatina (*Subulina*) *costulata* GREEF, Zool. Anzeiger 1882, p. 519.

e. Suture deep; striæ very regular, projecting; size small.

Species of East African Islands.

Though so widely separated geographically from the preceding group, there is absolutely no conchological character by which the following forms can be separated from the West African more than specifically.

7. T. COMORENSIS (Pfeiffer.).

Shell ovate-turrite, solid, lightly and irregularly striatulate, white under a deciduous tawny cuticle. Spire elongate, the apex rather obtuse. Whorls 7, the upper nearly flat, the penult. more convex, last whorl slightly exceeding one-third the total length, somewhat tapering at base. Aperture subvertical, elliptical, somewhat chanelled at the base; columella protracted to the base of the aperture, obliquely subtruncate; peristome obtuse, the margins joined by a rather thick callous. Length 34, diam. 13, length of aperture 12, width 6 mm. (*Pfr.*).

Comoro Islands (Cuming coll.).

Achatina comorensis PFR., P. Z. S. 1855, p. 211; Monogr. iv, p. 605.

Evidently related to *T. monacha,* but larger with one whorl less.

8. T. MONACHA (Morelet). Pl. 57, fig. 24.

Shell oblong turrited, rather solid, marked with obsolete, irregular striæ higher at the sutures; opaque, rather glossy, chestnut-reddish, generally darker at the base. Spire turrited, the apex rather obtuse. Whorls 8, a little convex, the last 3/8 the total length. Columella slightly arcuate, obliquely truncate. Aperture oblong-oval, ashen within, the margins obtuse, unexpanded. Length 32, diam. 12, alt. aperture 12, width 6 mm. (*Morel.*).

Great Comoro I. (Humblot).

Achatina (*Homorus*) *monacha* MOREL., Journ. de Conchyl. 1885, p. 290, pl. 14, f. 7.—*Homorus m.,* KOBELT, C. Cab. p. 96.

Larger and more solid than *T. cornea,* stouter and more strongly colored, and while larger, it has one whorl less; the columella is less arched, being almost straight. Some individuals, more slender than the types, are 33 mm. long, 11 wide (*Morel.*).

8*a*. Var. *olivacea* n. var. Pl. 57, figs. 25, 26.

In the specimens before me the cuticle is decidedly olivaceous or chestnut-green, the surface of the shell exposed by its loss being white. It is glossy, faintly striate, the striæ slightly stronger below the suture; the terminal cone is more strongly striate and the second and third whorls are crenulate below the suture (pl. 57, fig. 26). The last whorl has no indication of an angle, or change of sculpture or color at the periphery, such as occurs in many allied forms. The aperture is oblique, the outer lip blunt, black-edged. The columella is obliquely truncate, and there is a heavy columellar and parietal callous. The shell is thick, solid and opaque.

Length 31, diam. 10.6 mm.; length of eperture 10.6 mm.
Length 30, diam. 10.4 mm.; length of aperture 11 mm.
Great Comoro Island.

9. T. CORNEA (Morelet). Pl. 57, figs. 21, 22, 23.

Shell imperforate, subfusiform-turrited, rather solid, delicately striate, sometimes granulate; diaphanous, glossy, oily-corneous. Spire elongate, the apex rather acute, suture impressed. Whorls 9, slightly convex, the last about one-third the total length, tapering at the base. Aperture slightly oblique, acutely semioval, milk-white inside; peristome simple, unexpanded, the columellar margin arcuate, obliquely truncate. Length 28 to 32, diam. 9 mm. (*Morel.*).

Comoro Is.; Anjouan (Bewsher, type loc.); Great Comoro (Humblot).

Achatina cornea MOREL., Journ. de Conchyl. 1877, p. 335, pl. 13, f. 9; 1885, p. 289.—*Homorus c.*, KOBELT, C. Cab. p. 95.

The initial half whorl is smooth, raised, and forms the rather acute apex; then close, fine, regular and arcuate riblets set in, continuing for about two whorls, where they become less strong and regular, begin to be cut by weak spirals, and pass into the general sculpture of the rest of the shell. This sculpture consists of fine, irregular, rather sharp oblique striæ, coarser, stronger and arcuate just below the sutures, and cut by numerous spiral lines, producing long granules. In some specimens this decussation and granulation is very distinct, in others it is scarcely visible. Figs. 21 and 22 are copied from Morelet; fig. 23 is from an Anjouan example.

10. T. SIMPULARIA (Morelet). Pl. 57, fig. 28.

Shell turrited, the apex acute, rather solid, irregularly substriate, waxen, corneous-buff. Whorls 8½, scarcely convex, the last rounded, tapering at base, two-sevenths the length; suture linear, margined. Columella lightly arcuate, abruptly truncate; aperture slightly oblique, semioval; peristome simple, acute, unexpanded. Length 15, diam. 4.5 mm.

Comoro Is.: Mayotte, Moheli (Vesco); Anjouan (Bewsher).

Achatina simpularia MOREL., Revue Zoologique p. 220 (1851); Series Conch. i, p. 70, pl. 5, f. 4; Journ. de Conchyl. 1877, p. 336.—PFR., Monogr. iii, p. 496; iv, 613; vi, 233.—*Achatina pallens* PFR., P. Z. S., 1856, p. 35; Monogr., iv, p. 613; Novit. Conch., p. 105, pl. 29, f. 19, 20.

The glossy shell is marked with oblique, obsolete striæ, more apparent in the vicinity of the sutures; and under a lens it may be seen that the striæ are crossed by indistinct lines, sometimes very numerous in young shells. It was collected at Mayotte under dead wood on the shore, at a cane field. The specimens found at Anjouan are a little more delicate than those of Moheli, but otherwise like them (*Morelet*).

Achatina pallens Pfr., from Moheli, is considered a synonym by Morelet. It is described as with 9 whorls, length 16, diam. 4.75 mm., aperture 4.5 mm. long, 2.5 wide. In other respects the description agrees with that of Morelet. The type figure is copied, pl. 57, fig. 27.

The position of this species is unknown to me, but it seems to resemble *T. cornea* closely, and may be a diminutive member of the same group.

Subgenus BOCAGEIA Girard, 1893.

Bocageia GIR., Jornal de Sciencias Math., Phys. e Nat., Acad. Real Sci. Lisboa, (2), iii, p. 100 (August, 1893), for *B. lotophaga* Morel.

"Shell imperforate, long-oval, solid, subtransparent; spire lengthened, terminating in a subacute summit. Whorls of the spire 7, nearly flat, covered with very regular longitudinal striæ; suture superficial. Aperture oval, oblique; columella vertical, straight, very *obliquely truncate in the young, continuous with the basal margin in the adult* stage. Peristome simple, acute, the margins united by a thin callous.

"Jaw thin, arcuate, finely and densely plicate vertically. Radula with the central tooth very small, obtusely tricuspid; laterals with the middle cusp long and subacute, the side cusps short, subequal, and rounded; marginal teeth tricuspid, short, with the middle cusp short, rounded, and the side cusps small and subacute. Formula 19, 15, 1, 15, 19." (*Girard*). Pl. 62, fig. 19.

Type *B. lotophaga* Morelet. Distribution, Prince Island, in the Gulf of Guinea.

This group is chiefly characterized by the smooth early whorls, subobsolete columellar truncation, and vertically engraved surface of the shell, which has a somewhat pointed apex, not obtusely rounded as in *Pseudoglessula, Homorus* and *Subulona*. The lateral and marginal teeth of the radula are all tricuspid, as in *Homorus*.

Bocageia holds such a relation to *Trichodina* as *Metachatina kraussi* to *Cochlitoma*. It should probably be ranked as a subgenus of *Trichodina* rather than a distinct genus. The differential characters being assumed only in the fully mature stage, cannot be of long standing.

B. lotophaga was placed by Dohrn in his genus *Streptostele;* but he expressly states that he had not seen it, but had collected all the other species which he includes in the group.

11. T. LOTOPHAGA (Morelet). Pl. 56, figs. 18, 19, 20.

Shell imperforate, fusiform, very closely marked with impressed lines; solid, glossy, buff-green. Spire elongate, rather obtuse; whorls 7, flattened, the last longer than the spire. Aperture small, oval; peristome simple, acute, the margins joined by a thin callous; columellar margin in young specimens truncated as in Achatina (fig. 18). Length 25, diam. 9 mm. (*Morel.*).

Prince Island: S. Joao, at 200 meters alt. (Folin, Newton).

Bulimus lotophagus MOREL., Revue Zoologique 1848, p. 352; Series Conch. i, p. 15, pl. 1, f. 7 (1858).—*Achatina lotophaga* DESH., Fer. Hist., ii, p. 189, pl. 122, f. 15-17 (young).—PFR., Monogr. iii, p. 490.—*Streptostele lotophaga* DOHRN, Malak. Bl. 1866, p. 129.—CROSSE, Journ. de Conchyl. 1888, p. 297.—*Bocageia lotophaga* GIRARD, Jornal. Sci. etc. (2) iii, 1893, p. 100, pl. 1, f. 10 (teeth).

B. lotophaga, according to Morelet, is a cylindric shell which quite resembles *Glandina.* The surface is engraved with fine, regular deep striæ, imperceptible on the first whorls, and is covered with a thin uniform ochre-yellow cuticle, glossy in the young, and with a green tinge; but this gloss with a silky appearance diminishes with time, the epidermis also being partly lost. Quite rare in collections, this species has up to this time been found only on the Ile du Prince.

Genus CLAVATOR Martens, 1860.

Clavator MARTENS in Albers, Die Heliceen, edit. 2, p. 312 (Nov., 1860), for ''*Bul. obtusatus, clavator* Petit und *nanina nouleti.*''—KOBELT, Conchylien Cabinet, i, 13 Abth., 2 Theil, Die Familie Buliminidæ, pp. 649-655.—*Bulimus* and *Obeliscus* sp. of authors.

The shell is rather large, oblong or spire-shaped, imperforate or rimate, covered with a yellow cuticle streaked with brown. The summit is rather large, obtuse and rounded, the initial whorl smooth; following whorls are closely rib-striate, and sooner or later decussating spirals appear. This sculpture may continue to the last whorl or become obsolete there. Aperture ovate, the outer lip more or less obtuse, simple or slightly expanded; columellar lip free and built forward, or adnate. Columella subvertical, more or less distinctly folded, not truncate. The soft anatomy is unknown. Type *C. obtusatus* Gmel.

Distribution, Madagascar.

The species are illustrated on plates 48-51.

This group of handsome snails will probably be largely increased as Madagascar is further explored. The species resemble several diverse groups in other regions. *C. obtusatus* has a Stenogyroid contour, *C. grandidieri* is Placostyloid, and *C. balstoni, eximia* etc. recall *Thaumastus*.

The relation of *Clavator* to other genera cannot be intelligently discussed until the soft parts are investigated. Fischer (*Manuel*) placed the group under *Bulimus,* but nearly all other authors have considered it to be Stenogyroid. Besides the following species, *Obeliscus sceptrum* Beck, Index Moll. p. 61, a nude name, pertains to this group.

Key to Species.

1. Columellar lip built forward above the umbilical fissure which is thus left uncovered; peristome more or less thickened, obtuse; shell conspicuously striped with chestnut on a yellow ground.
    - *a.* Shell slender, attenuated above, the diam. less than one-third the length, rib-striate, whorls about 10. *C. obtusatus,* no. 2.
    - *aa.* Shell large, stout, Placostylus-like, the diam. usually much exceeding a third of the length; spire conic; last whorl smoothish, arcuately plicate at the suture; whorls about 8. *C. grandidieri,* no. 1.
2. Columellar lip reflexed over and nearly or quite closing the umbilical fissure, sometimes also thickened. Colors less strongly contrasting.
    - *a.* Diameter of shell less than one-third its length.
        - *b.* Spire slender and attenuate above; peristome but slightly or not thickened; whorls 9 to 10.
            - *c.* Lower whorls narrowly streaked with dark chestnut, sometimes wavy or mottled.
                - *d.* Length 52 to 60 mm. *C. moreleti,* no. 4.
                - *dd.* Length 80-95 mm. *C. humbloti,* no. 5.

cc. With pale bands at suture and periphery.
C. *watersi,* no. 3.

bb. Spire convexly-conic above; suture distinctly margined; size large. C. *eximius,* no. 9.

aa. Diameter of shell exceeding one-third its length.

b. Large species, 80-150 mm. long; spire convexly conic above, suture with a distinct, narrow margin; later whorls weakly decussate.
C. *eximius,* no. 9.

bb. Smaller, 50-70 mm. long; spire more straightly conic.

c. Diam. about half the length of the shell; spire straightly tapering. *C. heimburgi,* no. 8.

cc. Diam. decidedly less than half the length; spire thicker.

d. 66 x 24 mm.; whorls 8 to 9.
C. *clàvator,* no. 6.

dd. 53 x 21 mm.; whorls 7.
C. *johnsoni,* no. 7.

Group of C. obtusatus.

Shell conspicuously striped with chestnut on a yellow ground, the later whorls not spirally striate; *columellar lip built forward* above the umbilical fissure.

1. C. GRANDIDIERI (Crosse et Fischer). Pl. 49. fig. 29.

Shell subrimate, oblong, rather thin, longitudinally impressed with rather widely spaced striæ, not decussate. Spire long-pyramidal, the apex rather obtuse; suture crenulate-margined. Whorls 8, rather flat, the last slightly ascending, nearly half the total length. Aperture oblong-piriform; columella vertical, straight, receding. Peristome simple, the margins distant, somewhat converging, columellar margin very much dilated, very broadly reflexed over and closing the umbilical chink and reaching a width of as much as 10 mm. in the widest part. Basal and outer margins reflexed, somewhat thickened outside. Length 95, diam. 31, aperture 37 mm. long, 23 wide (*C. et F.*).

Madagascar: fossil in pleistocene dunes at Cape Saint Marie (Grandidier); recent at Andrahomana (Ch. Alluaud), and Fort Dauphin (F. Sikora).

Bulimus grandidieri C. et F., Journ. de Conchyl. 1868, p. 182, pl. 7, f. 1.—*Clavator grandidieri* C. et F., DAUTZENBERG, Journ. de Conchyl., 1900, p. 461; Bull. Soc. Zool. France, xxvii, 1902, p. 198, with var. *alba.*—*Clavator placostyloides* KOBELT, Nachrbl. D. M. Ges., 1900, p. 21 (Feb., 1900), with var. *abbreviata;* Conchyl. Cab., *Buliminus*, p. 651, pl. 99, f. 1, and var. *abbreviata,* f. 2.—*Clavator vayssierei* ANCEY, Journ. de Conchyl. xlviii, 1900, p. 12, pl. 1, f. 1, 2.

This species was originally described as a fossil from the dune deposits containing the eggs of Æpyornis. Fig. 29 is a copy of the type figure. Mr. Ph. Dautzenberg considers *C. placostyloides* and *C. vayssierei* to be recent specimens of the same species, remarking that while *grandidieri* as originally figured is narrower with a smaller aperture and less dilated lip than *placostyloides*, yet the examination of a number of specimens shows that the two forms are united by numerous specimens of intermediate contour.

1*a*. Var. *placostyloides* Kobelt. Pl. 48, figs. 26, 27, 28.

Recent specimens are certainly in the average wider and more compact than the type of *grandidieri,* with the aperture larger; and it is not improbable that they will constitute a recognizable variety, which will be called var. *placostyloides,* this name having precedence over that of *vayssierei* (figs. 27, 28). The types of both were collected at or near Fort Dauphin, on the southeast coast. Kobelt's record " nicht allzuweit von Antanarivo " was evidently a guess.

The shell has much resemblance to *Placostylus*. It is white under a polished yellow cuticle, copiously streaked with rich dark chestnut. The first whorl seems to be smooth. Those following are closely rib-striate and rather sparsely latticed by a few spiral striæ. The spirals soon disappear, and the rib-striæ diminish, becoming rather low and comparatively distant wrinkles on the last two whorls; but the suture for at least the last 2½ whorls is bordered below by strong, arcuate, oblique plicæ. The columella is strongly, obliquely truncate, though this scarcely appears except in an oblique view. The columellar margin is broadly dilated and concave. The later third of the last whorl ascends as in many species of *Placostylus*. The dimensions are variable. Whorls 7½ to 9.

Length 102, diam. 44; aperture 48 x31 mm. (type of *placostyloides*).

Length 107, diam. 42; aperture 46.5 x 29 mm. (type of *vayssieri*).

Length 88, diam. 42 mm. (Dautzenberg).

Length 85, diam. 42; aperture 44x33 mm. (var. *abbreviata*).

The variety *abbreviata* Kobelt is merely a short specimen. Dautzenberg notes a " var *alba*, entirely white under a light yellow epidermis, without flammules."

2. C. OBTUSATUS (Gmelin). Pl. 49, figs. 30, 31.

Shell perforate, slender, turrited, solid. White under a thin yellow cuticle, profusely streaked with chestnut on the last three to five whorls, wanting from the earlier ones. The surface is glossy and closely, evenly striate longitudinally. The first 2½ whorls are smooth, but sometimes self-amputated, the orifice closed by a convex partition. Whorls about 10, slightly convex, the suture bordered by a white line. Aperture small, its length less than one-third that of the shell, ovate, blue-white inside; peristome white, obtuse, somewhat thickened but not expanded; columellar lip dilated, flattened within; parietal callous thin and transparent.

Length 69, diam. 19 mm.; length of aperture with peristome 20 mm.

Length 74, diam. 23 mm. (decollate); aperture 24 mm.

Madagascar: Fort Dauphin (F. Sikora) and Andrahomana (Alluaud); Antanarivo (Kobelt).

Bulimus calcareus BRUG., Encycl. Méth.*Vers*, 1789, p. 328, no. 50.—LAMARCK, An. s. Vert., vi, p. 121; Edit. DESHAYES, viii, p. 228. Not *Helix calcaria* Born.—*Helix obtusata* GMEL., Syst. Nat. (13), p. 3655.—*Bulimus obtusatus* GMEL., Pfr. Monogr. ii, p. 151; iii, 396; iv, 455; vi, 94; viii, 130;

Conch. Cab. p. 50, pl. 15, f. 5.—Reeve, Conch. Icon. v, pl. 52, f. 344.—Desh. in Fér. Hist. p. iii, pl. 140, f. 9-11.—*Clavator obtusatus* Gm., Crosse & Fischer, Moll. Madag., pl. 22, f. 4.—Dautzenb., Bull. Soc. Zool. France xxvii, 1902, p. 198. —Kobelt, Conch. Cab. *Buliminidæ*, p. 650, pl. 95, f. 3, 4.—Ancey, Nautilus, xvi, p. 80.—? *Leptospira striata* Swains., Malacology, p. 335.

This is the most slender and lengthened species of the group, with more whorls than the others. At Andrahomana the specimens are large, 80 to 85 mm. long, and the surface is smoother and more glossy. Though so unlike in contour, *C. obtusatus* is related to *C. grandidieri* by its conspicuous color-pattern, and the raised, concave columellar lip.

2*a*. *Var. subobtusatus* (Crosse et Fischer). Pl. 49, fig. 35.

Shell narrowly rimate, long-turrited, rather solid, closely costulate-striate, rather shining, the suture impressed. The upper part of the spire is broken, the 4 whorls remaining being slightly convex, the last whorl not descending, a little larger than the penultimate and next earlier whorls. Columella straight, vertical. Aperture truncate-oval; peristome unexpanded, the margins distant, separated; columellar margin dilated reflexed, nearly covering the umbilical chink; basal and outer margins thickened. Length of broken shell 55, diam. 19 mm., aperture 20 mm. long, 14 wide. (*C. et F.*)

Southern Madagascar: fossil in the dunes near Cape Saint Marie (Grandidier).

Bulimus subobtusatus C. & F., Journ. de Conchyl. 1868, p. 183, pl. 7, f. 2.

The aperture in this form is said to be narrower towards the base than in *C. obtusatus,* the columella is more vertical, and the ends of the peristome are more separated. These differences are hardly sufficient to give the fossil form specific rank.

Group of C. moreleti.

3. C. watersi (Angas). Pl. 50, fig. 38.

"Shell imperforate, elongately turreted, rather thin, shining, finely irregularly longitudinally striated, the striæ here and there forming tessellated rows and patches, pale olive, lighter towards the apex, mottled with small brown spots and irregular markings, with indications of two paler bands, one below the suture, and the other towards the base of the last whorl; spire acuminate, somewhat obtuse at the apex; whorls 9, rather convex, the last of equal length with the spire; sutures impressed and slightly crenulate; aperture subovate, one-third the length of the shell, pale violet within; outer lip simple, scarcely thickened at the edge; columella with a slight callous below, a little arcuate towards the base. Alt. 3 inches, diam. 11 lines; length of aperture 1 inch." (*Angas*).

Madagascar.

Bulimus watersi ANGAS, P. Z. S. 1878, p. 311, pl. 18, f. 1.—*Obeliscus watersi* C. & F., Moll. Madagascar, pl. 22, f. 6.—*Clavator watersi* KOBELT, Conchyl. Cab., *Buliminidæ*, p. 649, pl. 95, f. 1 (after C. & F.).

"This species is allied to *B. obtusatus* Gmel., and *B. moreleti*, Desh., with which, including perhaps *B. clavator*, Petit and *B. balstoni* Angas, it combines to form a natural group of Madagascar *Bulimi*. The specimen from which my description is taken is in the collection of Sir David Barclay." (*Angas*).

4. C. MORELETI (Deshayes). Pl. 49, figs. 32, 33, 34, 36.

"Shell long-turrited, the apex obtuse; closely striate, the striæ irregular, frequently anastomosing; tawny, ornamented with narrow wavy brown streaks. Whorls 10, rather convex, the last short, ovate, imperforate at base. Aperture ovate, the lip thin, acute; columella narrow, white, acuminate at its summit and slightly twisted. Length 57, diam. 16 mm." (*Desh.*)

Madagascar.

Bulimus moreleti DESH., in Fér., Hist. ii, p. 114, pl. 154. f. 5, 6.—PFR., Monogr. iii, p. 397; Conchyl. Cab. p. 183, pl. 40, f. 1, 2.—*Clavator moreleti* Dh., CROSSE et FISCHER, in Grandidier, Madagascar, Moll., pl. 22, f. 5, 5*a*.—KOBELT, Conchyl. Cab. p. 653, pl. 99, f. 3, 4, (copy from C. & F.).

Deshayes has given a good description of this species, translated above. One of his figures has also been copied on my pl. 49, fig. 34. The specimen before me (pl. 49, figs. 32, 33) is similar except that the brown lines are not waved, but are nearly straight, there being only a trace of waviness in one or two places. The apex is obtuse, rounded, and eroded. The spiral lines are excessively weak except on the back of the last whorl, where they noticeably cut the rib-striæ (fig. 32), which while very close and regular on the spire, are more or less obsolete on the last part and base of the last whorl. The lip is thin and simple. Length 52, diam. 16.5 mm.; length of aperture 16.7 mm. Whorls 9½.

Pfeiffer and Crosse and Fischer have figured much larger, broader specimens. One of the figures of the latter authors is copied, pl. 49, fig. 36.

5. C. HUMBLOTI ('Ancey' Mabille).

Shell large, imperforate, long and tapering, rather solid, covered with a brown-buff cuticle, which below is narrowly transversely many-banded with brown; under the cuticle it is white and rather shining. The spire regularly tapers to the apex, is long and obtuse. Whorls 9 ? (the upper broken), regularly increasing, a little convex, separated by a moderate suture which at the last whorl is minutely and lightly subcrenulate; grooved by close longitudinal growth striæ, which on the last 5 whorls are decussate with more spaced spiral impressed lines; the last whorl elongate, tapering downwards. Aperture somewhat oblique, slightly receding at base, irregularly oblong-tapering, angular above, broad below, bluish inside. Columella angularly produced in front, twisted, subplicate, rather thick. Peristome obtuse, dilated and adnate above the columella, the margins distant, joined by a glossy callous, especially conspicuous at the base (Ancey).

Length 95, diam. 27.5, alt. apert. 31 mm. (Anc.).

Length 80, diam. 27, alt. apert. 29 mm. (Mabille).

Madagascar: Antankaratra country (Humblot).

Bulimus humbloti Anc., MABILLE, Bull. Soc. Philomath. de Paris, x, 1885-'86, p. 127.—*Clavator humbloti* ANCEY, Nautilus, xvi, p. 80, Nov., 1902.—Kobelt, Conchyl. Cab., p. 974.

"This fine species appears to be allied to *Cl. moreleti* Desh., but is much larger and is very distinct" (*Ancey*).

Group of C. clavator.

6. C. clavator (Petit). Pl. 48, figs. 24, 25.

Shell turrited, rather thick, white, covered with a yellowish epidermis; whorls 8 to 9, convexly depressed, longitudinally closely wrinkled, the suture impressed, subcrenulate. Spire conic-elongate, the apex obtuse. Aperture piriform; peristome thickened, obtuse. Columella subtriangular, straight at the base, compressed within, oblique above. Umbilicus narrow and crevice-like. Length 66, diam. 24 mm. (*Petit*).

Madagascar: in the south part, at St. Augustine Bay (M. Guilain).

Bulimus clavator Petit, Revue Zool. 1844, p. 3; Guerin's Mag. de Zool. 1844, Moll. pl. 94, (*Bulimus clavatus* Petit on plate).—Reeve, C. Icon. v, pl. 52, f. 345.—Pfr., Monogr. ii, p. 142.—*Clavator clavator* Petit, Kobelt, Conchyl. Cab., *Buliminidæ*, p. 649, pl. 95, f. 2.—*Clavator petiti* Crosse & Fischer, in Grandidier, Moll. Madagascar, pl. 22, f. 2.

The description and figures are from Petit.

7. C. johnsoni (E. A. Smith). Pl. 50, fig. 37.

"Shell moderately thick, imperforate, elongate, subcylindrical, slightly shining; rich brown, with darker streaks here and there, paler towards the apex, where the epidermis is mostly worn off, leaving a white surface; last whorl indistinctly transversely zoned and lineated with dark brown. Volutions 7, rather convex, regularly increasing, longitudinally striated by the lines of growth, which are more or less puckered beneath the suture, and at times somewhat wrinkled through being crossed by a few obsolete transverse striæ. The extreme upper edge of the whorls is yellow at the suture. Body-whorl scarcely descending in front. Aperture inversely auriform, blue within, occupying three-eighths of the entire length of the shell. Outer lip thickened within, dirty whitish. Inner lip of the same color, thickened also, narrowly expanded in the umbilical region, joined to the labrum above by a thin callous. Length 53 millim, width 21; aperture 20 long, 11½ broad." (*Smith*).

Madagascar: near the river Anonive, about fifty miles south of the capital, Antananarivo. (W. Johnson).

Stenogyra (*Clavator*) *johnsoni* SMITH, P. Z. S. 1882, p. 382, pl. 22, f. 5.—*C. johnsoni* Sm., KOBELT, Conchyl. Cab. p. 654, pl. 100, f. 4, 5.

This form seems to be most nearly related to *C. clavator* Petit. Mr. Smith writes as follows: "This species might be regarded by some as a dwarf form of *S. eximia,* Shuttleworth; but, besides size, there are other distinctions. Mr. Johnson says he never could find the larger species at the above locality, nor did he ever meet with the smaller one in company with it elsewhere. As the last whorl in the present species scarcely descends at all, the suture is less oblique than in *S. eximia;* the surface is less puckered by transverse striæ, the breadth of the shell is greater in proportion to its length, the last whorl is less cylindrical, the columella is not so broadly reflexed or flattened in front, and the aperture is narrower at the base."

8. C. HEIMBURGI Kobelt. Pl. 51, figs. 42, 43.

Shell scarcely rimate-perforate, ovate-acuminate, solid, scarcely shining (subfossil); white ornamented with wide irregular brown streaks. Spire exactly conic, the summit rather obtuse, apex turned in; suture impressed, somewhat irregular, much lacerated at the lower whorls. Whorls 8½, very little convex, the upper ones regularly costellate-striate, the following distinctly costellate, last whorl with the riblets more or less obsolete, irregular, smoother towards the base; longer than the spire, irregularly descending in front, sloping to the aperture above. Aperture ovate, acuminate above, subvertical, whitish inside; peristome a little thickened, obese, the margins joined by a thick callous, the outer and columellar margins subparallel; outer margin straight, deeply sinuate in the middle; basal margin expanded, spreading, but only slightly reflexed; columellar margin thickened, dilated, reflexed, nearly closing the umbilicus, peculiarly excavated inwardly. Parietal callous with a somewhat tooth-like fold, alt. 51, diam. 25 mm., aperture 24 mm. high, 17.5 wide outside. (*Kobelt*).

Madagascar (F. Sikora).

Clavator heimburgi Kob., Conchyl. Cab. p. 730, pl. 107, f. 13, 14; Nachrbl. D. M. Ges. 1901, p. 96.

9. C. eximius (Shuttleworth). Pl. 51, figs. 45, 46.

Shell dextral, cylindric, thin, striate, obsoletely decussate with wide-spaced spiral lines, olivaceous-brown, somewhat glossy. Spire long, the apex conoid, obtuse, pale. Whorls 8, slightly convex, the upper ones slowly, the lower rapidly increasing; last whorl two-fifths the total length. Columellar plate thick, white, strongly twisted, tapering downwards and scarcely truncate. Aperture narrow, inverted subauriform; peristome simple, unexpanded, acute. Length 120, diam. 40 mm.; aperture 46 mm. long, 24 wide (*Shuttlew.*).

Madagascar (Verreaux).

Spiraxis eximia Shuttlew., Diagn. n. Moll. no. 2, in Mittheil. Bernischen naturforschenden Gesellschaft, 1852, p. 208.—Pfr. Monogr. Hel. Viv. iii, p. 469.—*Achatina eximia* Shuttw., Notitiæ Conchologicæ ii, p. 13, pl. 4, f. 2 (1877). —*Clavator eximius* Sh., Kobelt, Conchyl. Cab. p. 653.

Shuttleworth's description and figures are reproduced. The type was an immature shell, remarkable for its great size. Smaller forms of the species occurring on the southwest coast, have been described as *B. balstoni,* and a larger specimen as *C. herculea.* These several forms seem to be separated by no important differences apart from size. They seem to be local races.

Bulimus columba Brug., Encycl. Méth. i, p. 319, may have been based upon this species, but it was not recognizably described, and has never been identified.

9*a*. Var. *herculeus* (Ancey).

Shell the size of *eximia;* differs from *Cl. balstoni* Angas not only in the great size but also in the more produced spire, 9 instead of 8 whorls, the shell longer and a little more solid, aperture more thickened, columellar margin longer, thick, the summit subacute. (*Ancey.*)

Length 144, diam. 45.5, alt. aperture 48 mm.

Length 139, diam. 41, alt. aperture 42.5 mm.

Northwestern Madagascar (Humblot).

Bulimus herculeus Ancey in Mabille, Diagnoses test. nov., in Bull. Soc. Philomath. de Paris, ser. 7, x, 1885-86, p. 182.—*Clavator herculeus* (Anc.) Mab., Kobelt, Conchyl. Cab. p. 972.—*Clavator balstoni* Angas var.? *herculea* Ancey, The Nautilus xvi, p. 68.

This form is spirally striate like *C. eximius,* of which it is apparently merely a local variety. The last measurements given above are from Ancey's original description.

9*b*. Var. BALSTONI Angas. Pl. 51, fig. 44; pl. 50, fig. 39.

"Shell imperforate, elongately ovate, somewhat thin, shining, irregularly striated, and crossed here and there with concentric lines, giving portions of the surface somewhat of a tessellated appearance, rich chestnut-brown, paler towards the apex; spire elongately conical, somewhat obtuse at the apex; whorls 7, slightly convex, the last longer than the spire; sutures impressed, margined, and crenulated; aperture ovately oblong, bluish purple within; outer lip slightly arcuate, and a little thickened at the edge; inner lip with a strong callous, which is slightly flattened and expanded over the columella."

"Alt. 3 inches 9 lines, diam. 1 inch 4 lines; length of aperture 1 inch 5 lines, breadth 9 lines." (*Ang.*).

Madagascar: Ekongo on the southeast coast (Waters); Imerina (F. Sikora); Antankaratra country (Humblot).

Bulimus balstoni Angas, P. Z. S., 1877, p. 527, pl. 54, f. 7.—*Clavator eximius* Sh., Kobelt, Conchyl. Cab. *Buliminus,* pl. 100, f. 1.—*Clavator balstoni* Angas, Ancey, Nautilus xvi, p. 68.

This fine snail differs from *C. eximius* in little but the smaller size. Angas' type measures about 93 mm. long; that drawn in pl. 50, fig. 39, is 97 mm. long, and Kobelt figures a shell 100 mm. long. The type of *C. eximius,* not fully mature, is 120 mm. long.

The last whorl is rich chestnut with darker and lighter streaks, preceding whorls being mainly yellow with chestnut streaks. The suture is hardly impressed at first, but its depth increases to the last whorl. On the last three whorls it has a distinct, crenulate margin below. The striation is weak and irregular on the later whorls, and the spiral decussation while weak is readily visible.

Ancey remarks that a specimen from Imerina is shorter and more ventricose than others he has seen.

9*c*. Var. *crossei* Kobelt. Pl. 50, figs. 40, 41.

Shell smaller, the length about 85 mm.; spiral sculpture inconspicuous.

Clavator eximius CROSSE et FISCHER, in Grandidier, Moll. Madag., pl. 22, f. 1, 1*a*.—*Clav. crossei* or *Cl. eximius* var. *crossei* KOBELT, Conchyl. Cab. p. 654, pl. 100, f. 2, 3 (copied from C. & F.).

Crosse and Fischer's figures, copied on my plate, show faint spiral striation on the penult. whorl. I consider this, like *C. balstoni,* merely a small form of *C. eximius.*

Genus RIEBECKIA v. Martens, 1883.

Riebeckia v. MART., Conchol. Mittheilungen ii, p. 148 (1883), type *Stenogyra sokotorana.*—KOBELT, Conchyl. Cab. i, 10te Abth., p. 84.—SMITH, in The Natural History of Sokotra and Abd-el-Kuri, 1903, pp. 131-137 (monograph). —*Balfouria* CROSSE, Journ. de Conchyl. 1884, p. 356, for *Stenogyra hirsuta* G.-A.

Shell turrited, perforate or closed, composed of 10 to 15 compactly coiled whorls; pale, not variegated, vertically striate, decussate or smooth, rarely hairy. The two embryonic whorls form a globose, obtuse summit, which is retained entire in the adult stage. Aperture less than one-fourth the total length, the outer lip simple, columella vertical or arcuate, varying from distinctly truncate below to almost continuous.

Radula of *R. sokotorana,* according to data supplied v. Martens by Schako, has the middle tooth weakly tricuspid, not so small as the simple one of *Achatina.* The lateral teeth are bicuspid as in *Limicolaria* and *Pseudoglessula retifera,* while they are tricuspid in most Stenogyras. The marginal teeth are bicuspid as in *Achatina,* in part with the side cusp bifid.

Type *R. sokotorana.*

Distribution, Island of Socotra.

Beyond the dentition, nothing is known of the soft anatomy of this group. Its position in the series is therefore quite uncertain. The species are figured on plate 54 and part of 55.

1. R. SOKOTORANA (Martens). Pl. 54, figs. 73 to 79.

Shell turrited, solid, delicately cancellated with vertical wrinkles and impressed spiral lines, pale yellow and white, uniform. Whorls 11-13, the first two forming an obtuse apex, the following regularly increasing, a little convex, the later whorls proportionally high. Aperture occupying about two-sevenths the total length; outer margin simple, obtuse, columellar margin arcuate, subvertical, obliquely truncate and emarginate below. Length 56-76, diam. 18-24, length of aperture 17-22, width 10-14 mm. (*Marts.*).

Socotra: Eastern end of the island, on limestone. Occurs in enormous numbers in the ground under rock ledges.

Achatina sokotorana v. MARTENS, Nach. mal. Ges. xiii, Oct. 1881, p. 135.—*Stenogyra* (*Riebeckia*) *sokotorana* v. MARTS., Conchol. Mittheil. ii, p. 147, pl. 29, f. 1-8 (1883).—E. A. SMITH, Nat. Hist. Sokotra etc., p. 131 pl. 13, f. 15, a young shell.—*R. sokotorana* KOBELT, Conch. Cab. p. 84, pl. 28, f. 1-3. —*Stenogyra fumificatus* GODWIN-AUSTEN, P. Z. S. 1881, p. 810, pl. 69, f. 2 (reproduced in SMITH, N. H. Sokotra, p. 131, f. a, b.).

The shells of this species are often used for pipe bowls by the natives. It differs from the following species by the large size of the apex, and the distinctly channeled suture, especially of the upper whorls (pl. 54, figs. 77-79).

2. R. DECIPIENS (E. A. Smith). Pl. 54, fig. 83 (and fig. 82).

"Shell similar to that of *S. sokotorana,* but more attenuated at the apex; suture not channelled; sculpture finer and not cancellated." (*Smith*).

Length 88, diameter 30 mm.; apert. 27 mm. long.

Length 78, diameter 25 mm.; apert. 22 mm. long.

Sokotra: Adho Dimellus, 3500-4000 ft. Underground at base of high granite cliffs (H. O. Forbes).

Stenogyra (*Riebeckia*) *decipiens* E. A. SMITH, Journ. of Malacol., vi, p. 37 (Jan. 22, 1898); Nat. Hist. of Sokotra etc., p. 132, pl. 13, f. 14, young shell.

"Larger than *S. sokotorana.* Although quite similar in general appearance, as I have stated in the Journal of Malacology (*loc. cit.*), this species is certainly distinct from *S. sokotorana.* The top of the spire is more slender, the suture is not deeply cut or channelled, and the sculpture is much finer, consisting of fine lines of growth and excessively fine spiral striæ. It is possible that some of the shells figured by Martens (Conch. Mittheil, vol. II, pl. 29) may belong to this species, figs. 7a, 7b, and 8 especially having a very striking resemblance to it" (*Smith*).

Pl. 54, fig. 82 is a copy of one of v. Marten's figures which Mr. Smith believes to be referable to *decipiens.*

3. R. GOLLONSIRENSIS (Godwin-Austen). Pl. 54, figs. 80, 81.

"Shell dextral, elongately turreted; sculpture smooth, with shallow lines of growth; color dull white; spire turreted, apex rounded, solid; suture moderately impressed; whorls 12, sides very slightly convex; aperture fusiform; peristome thin; columellar margin solid, straight, and scarcely reflected. (*G.-A.*).

Length 61.8, diam. 18.2, alt. apert. 14.3, width 9.2 mm.

Sokotra: On limestone at an altitude of over 1000 ft. on the top of the ridge overlooking Gollonsir village, and on the S. W. of it; at the west end of the island, not abundant (Bent); Homhil, 1500-2500 ft.; under roots of bushes on the top of Hamaderu (Forbes).

Stenogyra gollonsirensis G. A., P. Z. S. 1881, p. 809, pl. 69,

f. 1.—*S.* (*R.*) *gollonsirensis* SMITH, Nat. Hist. Sokotra, etc., p. 132, pl. 13, f. 12.

"In the form of its aperture this shell approaches the subgenus *Bacillum* of Theobald, from Eastern India." (*G.-A.*).

"This species is about the same size as *S. sokotorana,* but differs in form and sculpture. The body-whorl is very much shorter and the other whorls higher than in that species. In fresh specimens the sculpture consists of fine lines of growth, crossed by excessively fine crowded spiral striæ, giving the surface a subangular textured appearance. The epidermis is yellowish olive, interrupted at the middle of the body-whorl, so that the lower is whitish. Here and there occur a few brown streaks in the direction of the lines of growth. The type of the species is a dead bleached shell which has lost most of the surface sculpture through exposure to the weather" (*Smith*).

4. R. ADONENSIS (Godwin-Austen). Pl. 55, figs. 85, 86, 87, 88.

"Shell not rimate, dextral, elongately turreted, glassy, polished; a few faint longitudinal shallow lines of growth; colour very pale ochraceous; spire high, sides slightly convex; apex blunt, rounded, and rather rapidly tapering at the fifth whorl; suture shallow, adpressed; whorls 10, somewhat convex; aperture elongately oval, subvertical; peristome thin; columellar margin thin, straight. Length 24.8, diam. 8.5, alt. apert. 7 mm. (*G.-A.*)

Sokotra: only found in one locality, east of Hadibu, near a place called Adona, altitude over 1500 feet, rock granite (Bent). Adho Dimellus, 3500-4500 ft.; Homhil, 1500-2500 ft. (Forbes). Above the Wady Kischen, in crevices in the granite, 1000 meters elev. (Riebeck and Schweinfurth).

Stenogyra adonensis G.-A., P. Z. S. 1881, p. 810, pl. 69, f. 4, 4a.—*S.* (*R.*) *adonensis* SMITH, Nat. Hist. Sokotra, etc., p. 134.—*Stenogyra socotorana* v. MARTS. Nachrbl. D. mal. Ges. 1881, p. 137.—*S. enodis* v. MARTS. Conchol. Mittheil. ii, p. 149, pl. 28, f. 14-16 (not of Godwin-Austen).

"This shell approaches somewhat in its general form to *B. magilensis* Craven, from Magila, East Africa." (*G.-A.*).

"This species varies considerably in stoutness, some examples being much more slender than others. The type is 25 millim. long and 8½ broad. A narrowed specimen is 26 long and 7½ broad, whereas the broadest example is 23½ long and 9 in diameter. Although the extreme forms have a very dissimilar look, they appear to be connected by the intermediate links occurring in the series of specimens examined. A comparison of a typical specimen of *S. sokotorana* kindly submitted by Professor von Martens, proves that that species is identical with the present and not with *S. enodis*, as he originally supposed. The latter, the type of which was a very young shell, is a very much more slender form altogether, and of a pellucid white color, the present species being greenish yellow." (*Smith*).

5. R. ENODIS (Godwin-Austen). Pl. 55, figs. 97, 98.

"Shell dextral, elongately turreted, not rimate, very thin, glassy, diaphanous; no sculpture; color milky white; spire long, apex blunt and rounded, suture moderately deep; whorls 9, sides convex, regularly increasing; aperture quadrate, subvertical (not fully formed); peristome thin; columellar margin straight, vertical. Length 13, diam. 4, alt. aperture 2.8 mm. (*G.-A.*).

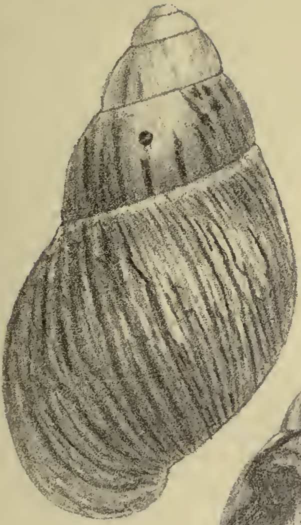
Sokotra: South side of the island, from limestone rocks, altitude 1000 feet. (Balfour); Jena-agahan, 1200-2500 ft. (Bent); under stones on Gebel Fedehen (H. O. Forbes).

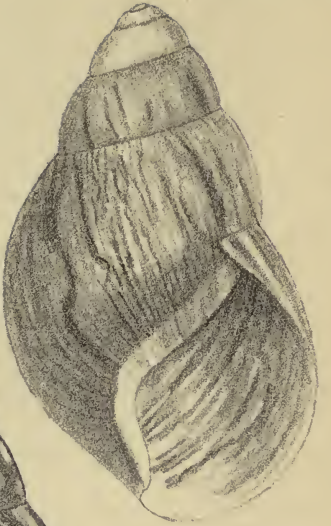
Stenogyra (*Subulina?*) *enodis* G.-A., P. Z. S. 1881, p. 811, pl. 69, f. 5 (young shell).—*S.* (*Riebeckia*) *enodis* SMITH, Nat. Hist. Sokotra, p. 135, pl. 13, f. 16.

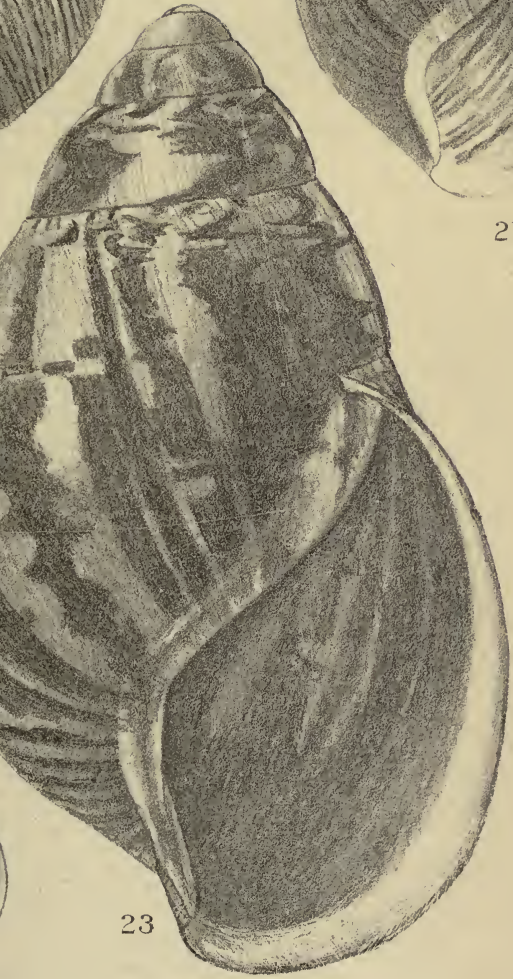
"The unique type being a very young shell, gives only a poor idea of this interesting species. The largest specimen examined consists of 15 whorls, and is 37 mm. in length, 8 in diameter. The aperture is inversely auriform, and the columella a little thickened and arcuate, and exhibits a slight anterior truncation. The last whorl is rounded at the periphery" (*Smith*).

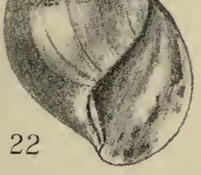
6. R. INSCULPTA (E. A. Smith). Pl. 54, fig. 84.

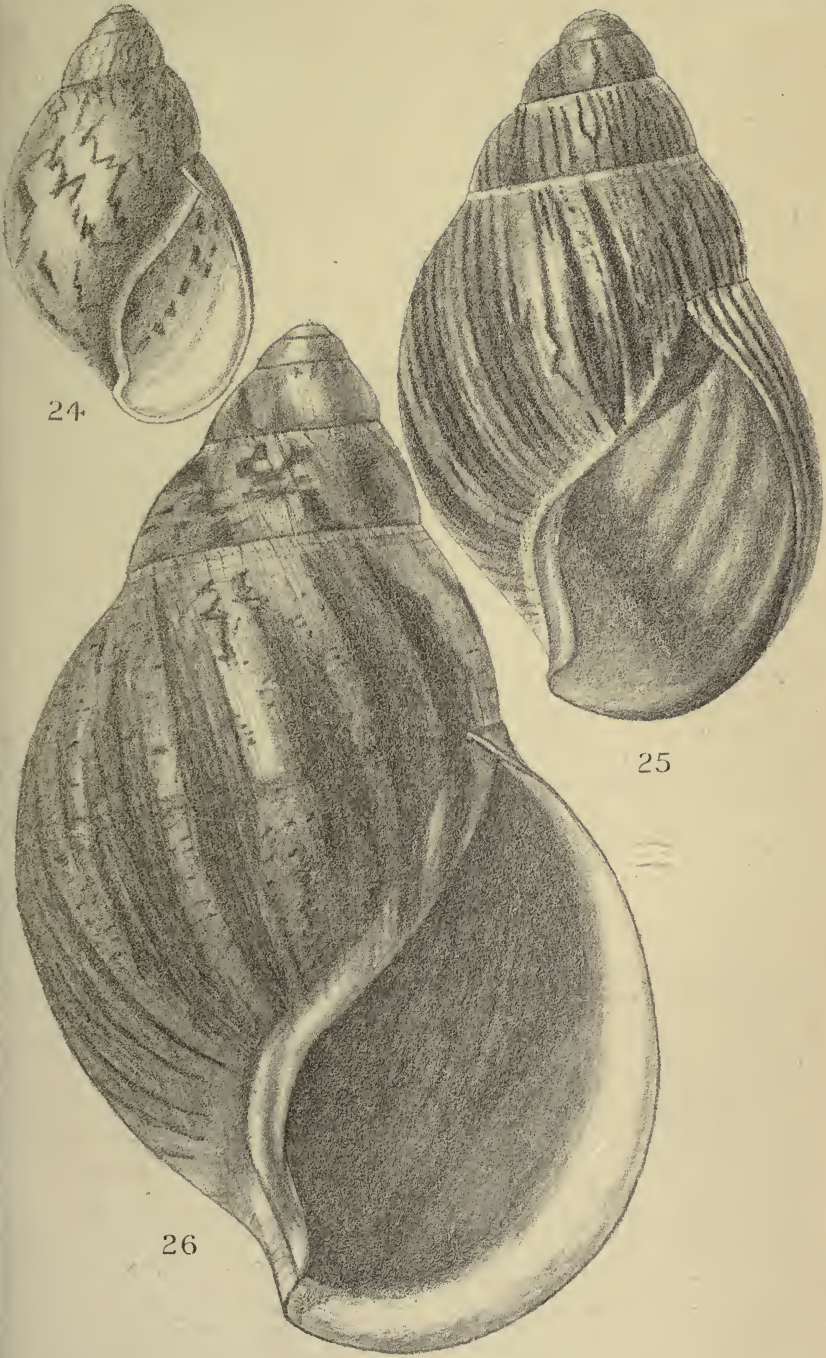
"Shell subulate, imperforate, white; whorls 15, very gently

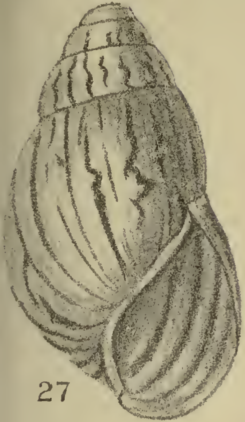

20

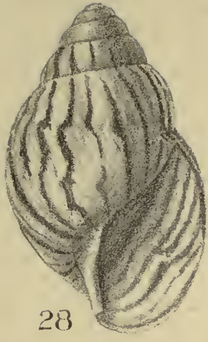

21

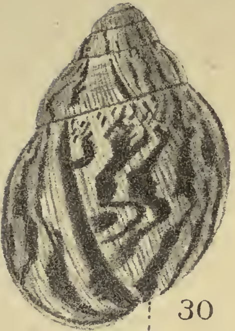

23

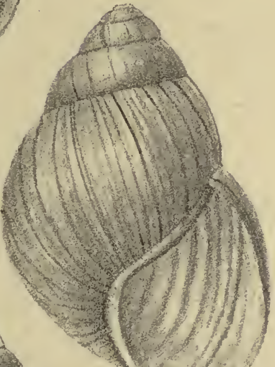

22

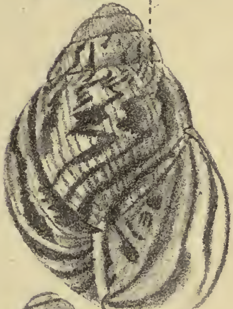

24
25
26

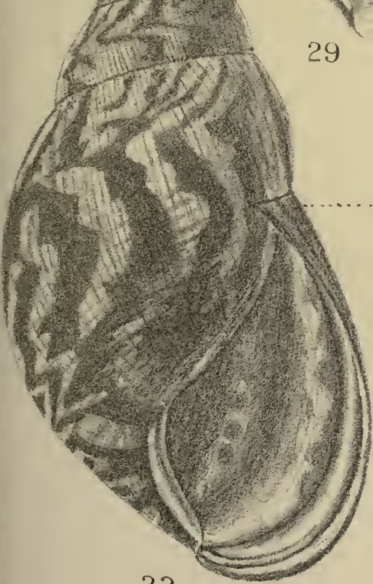

27

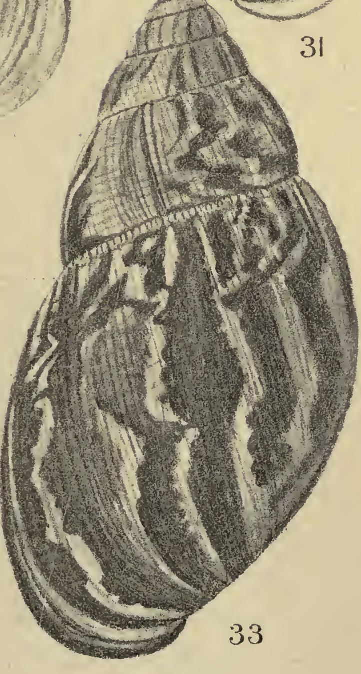

28

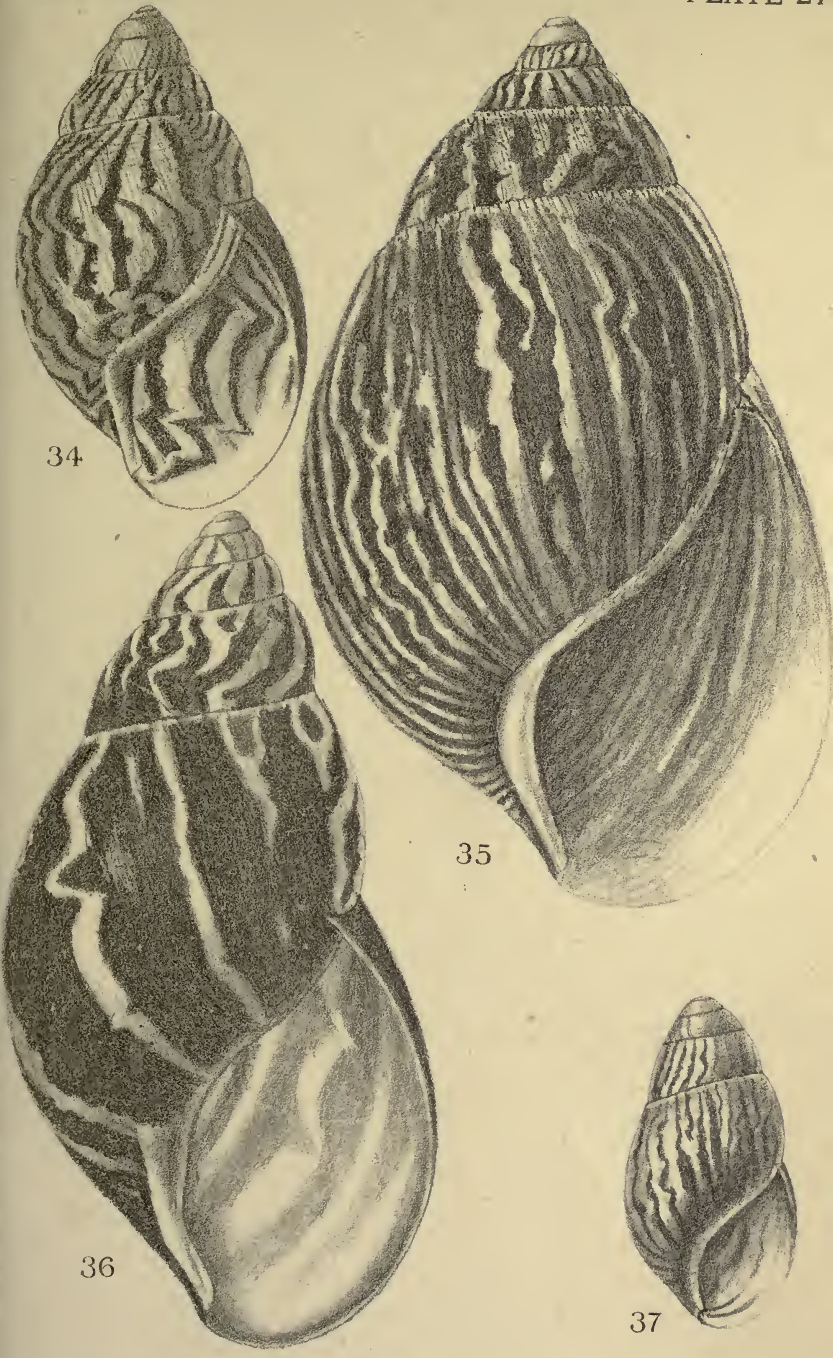

30

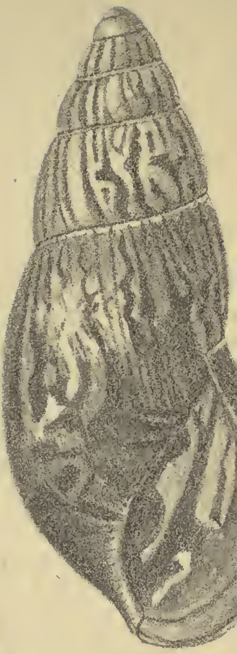

29


31

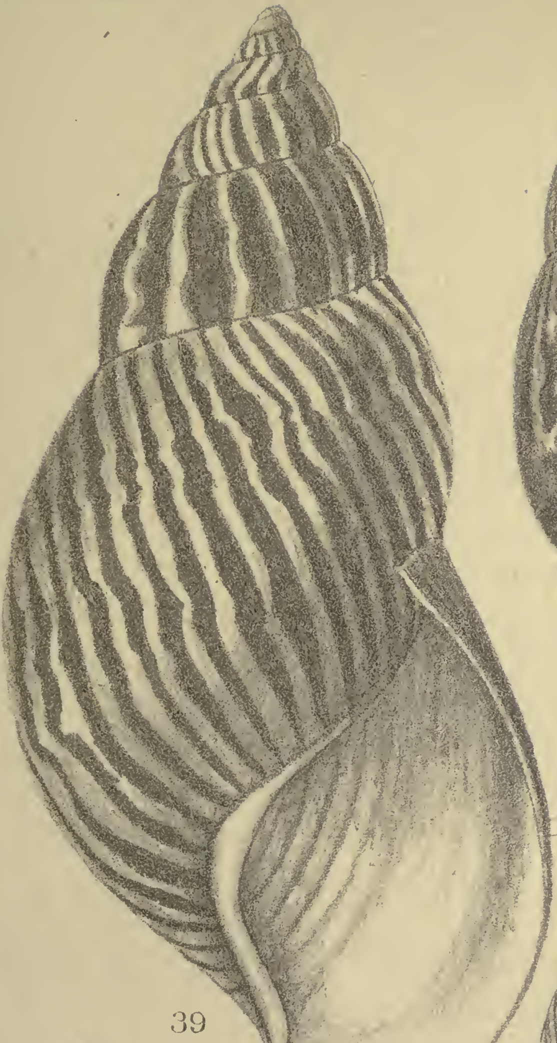

32


33

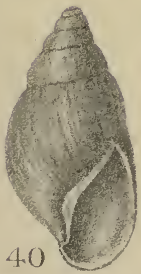

34
35
36
37



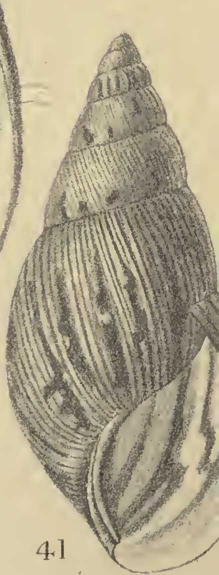
38



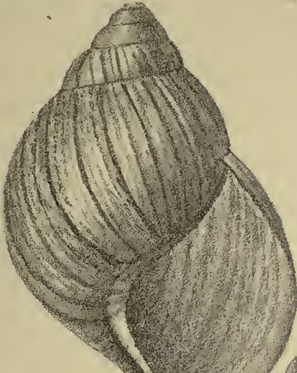
39



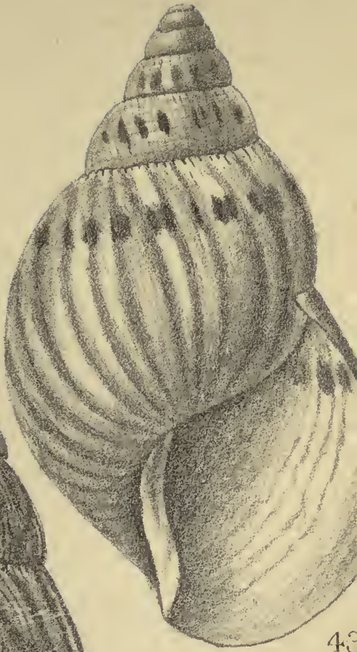
40



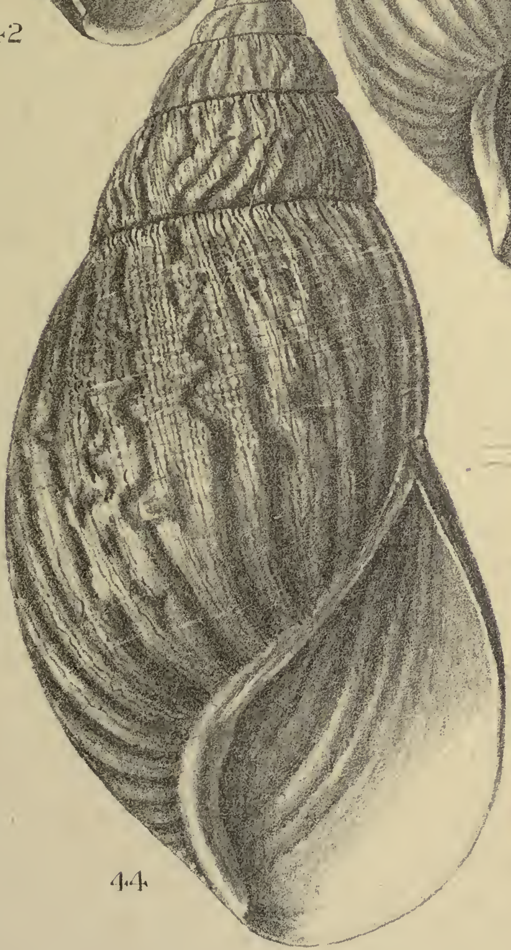
41



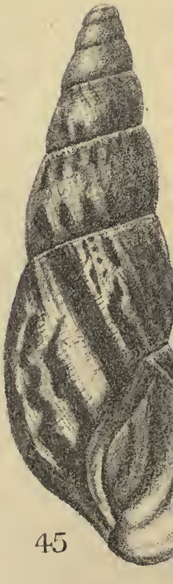
42



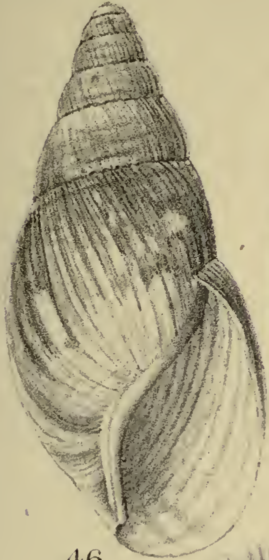
43



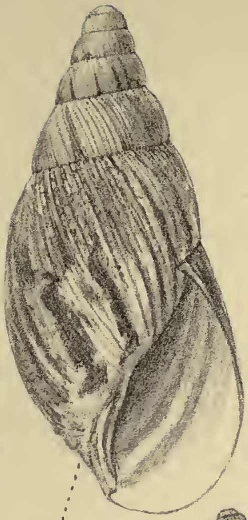
44



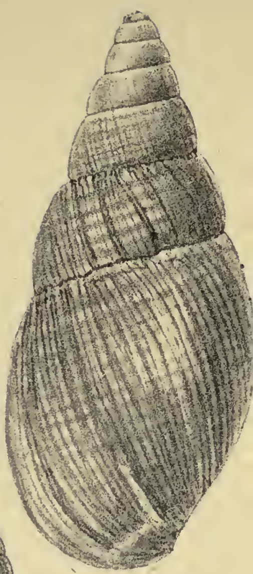
45



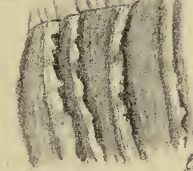
46



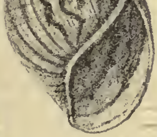
48



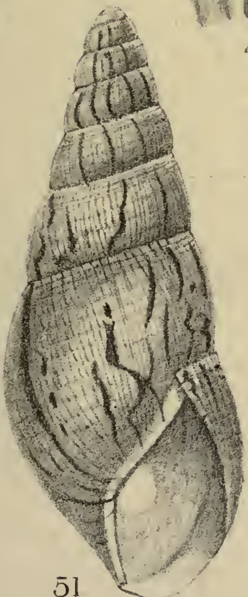
47



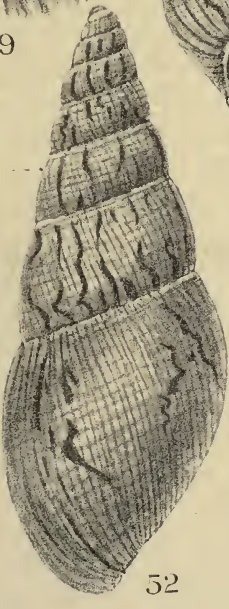
49



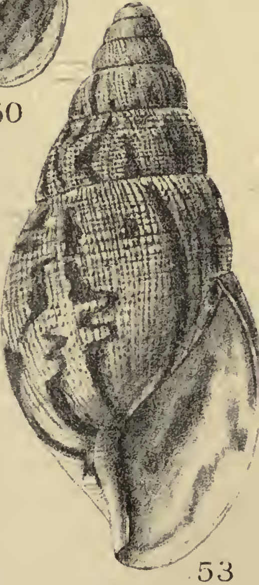
50



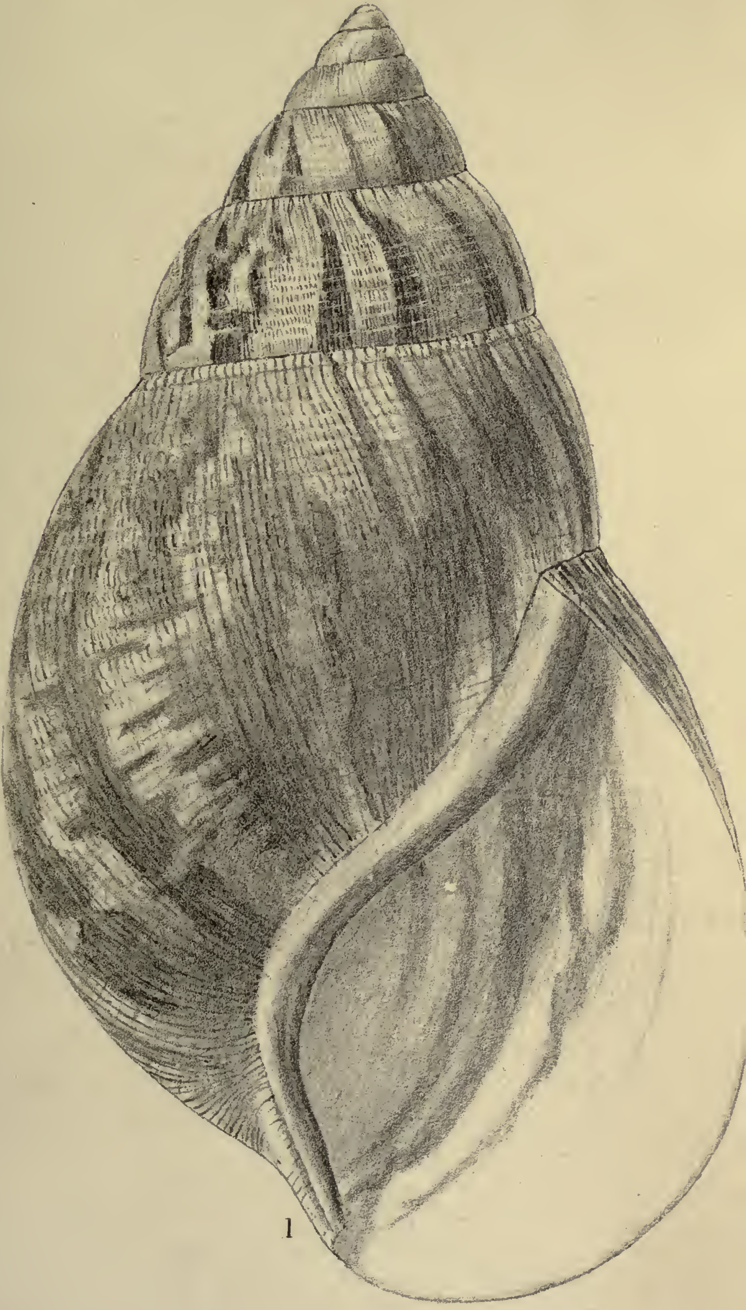
51

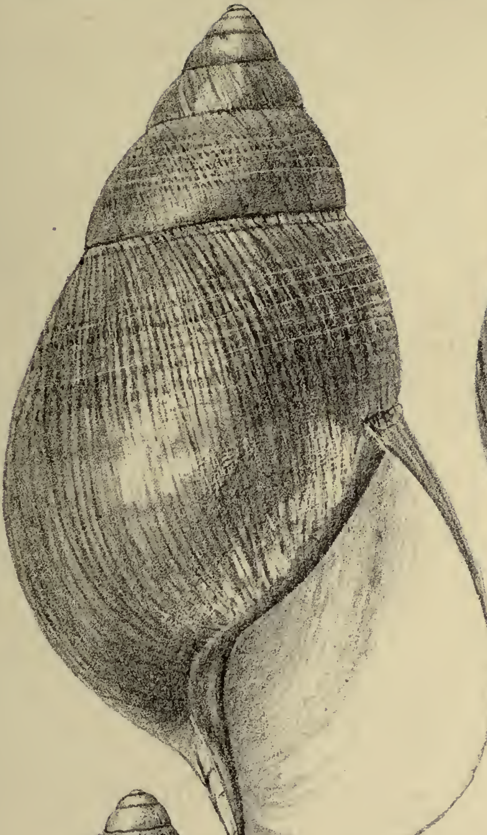


52

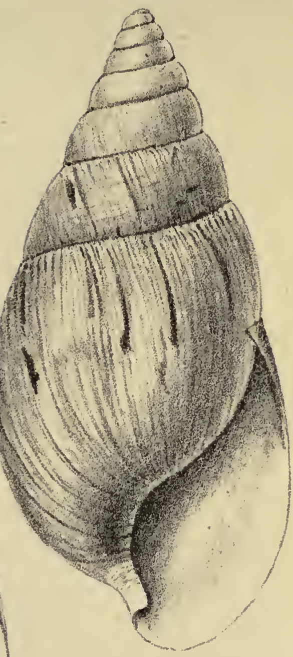


53

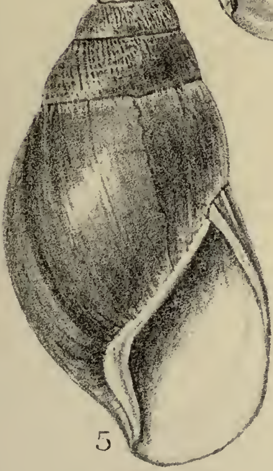

1



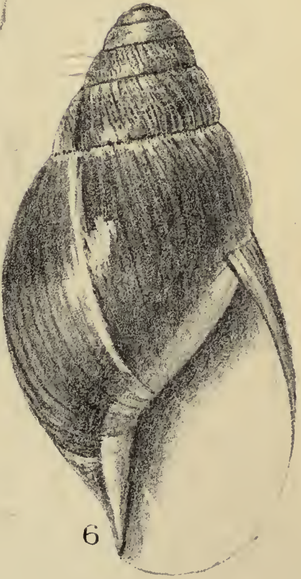
3



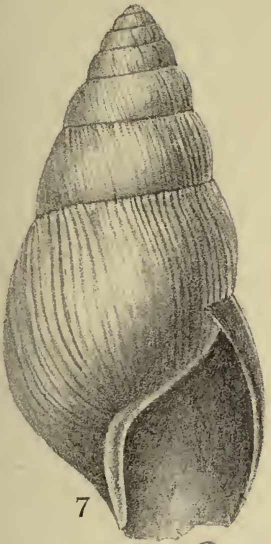
4



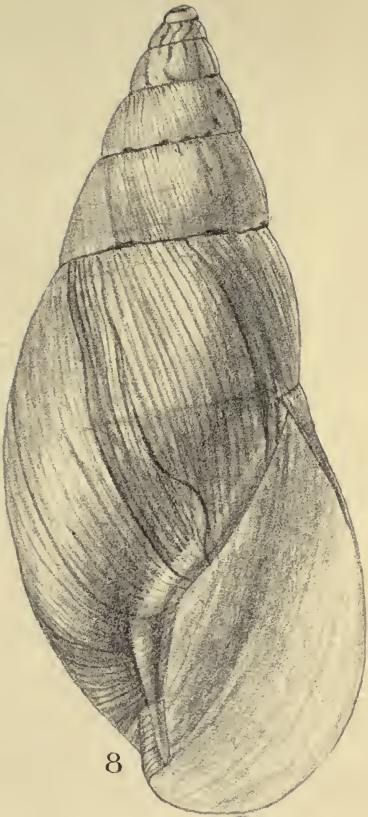
5



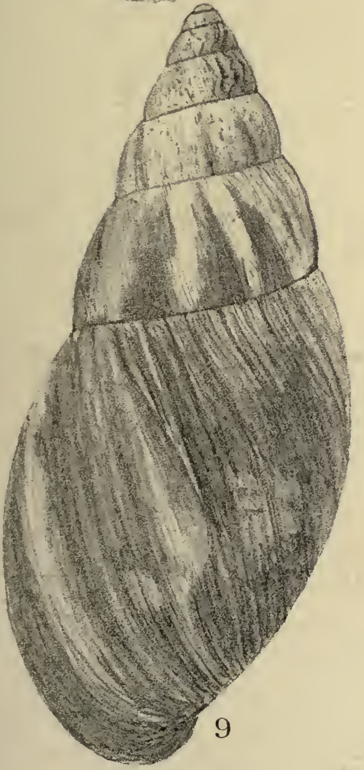
6



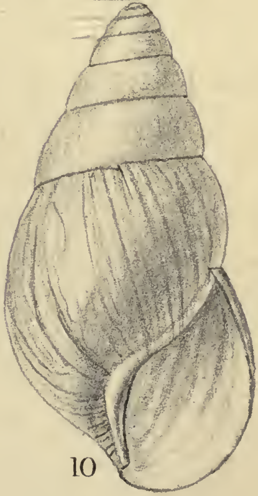
7



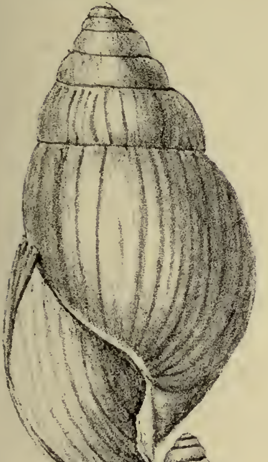
8



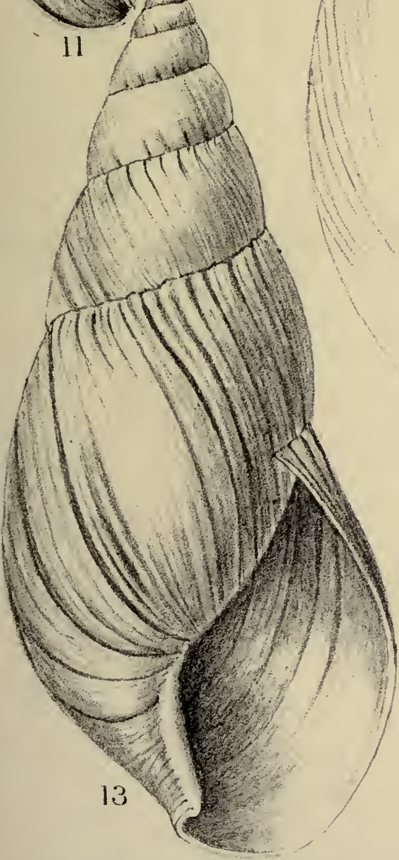
9



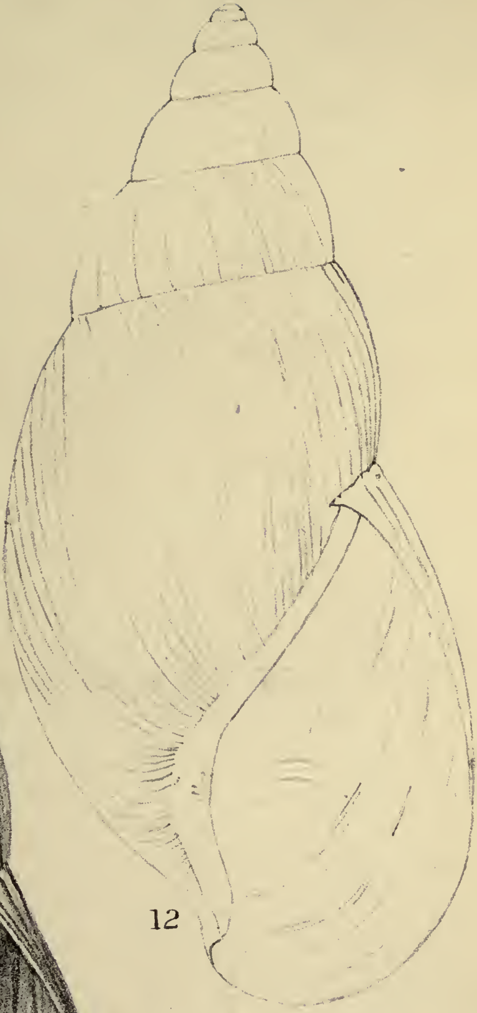
10



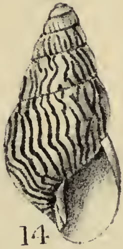
11



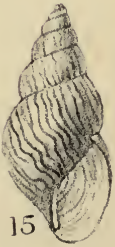
13



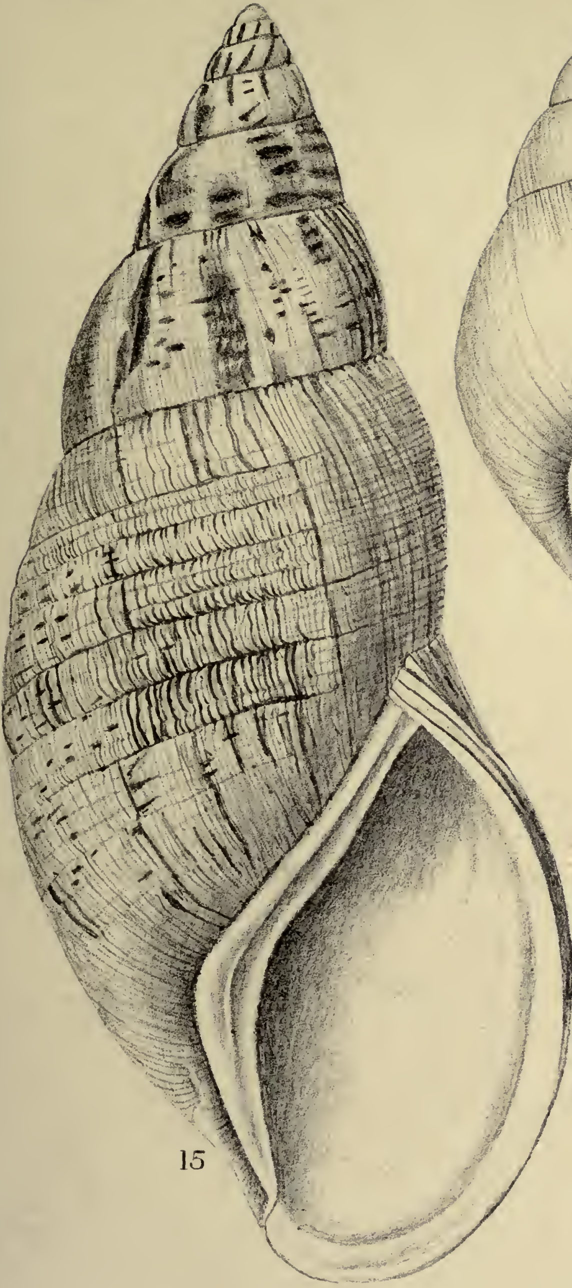
12

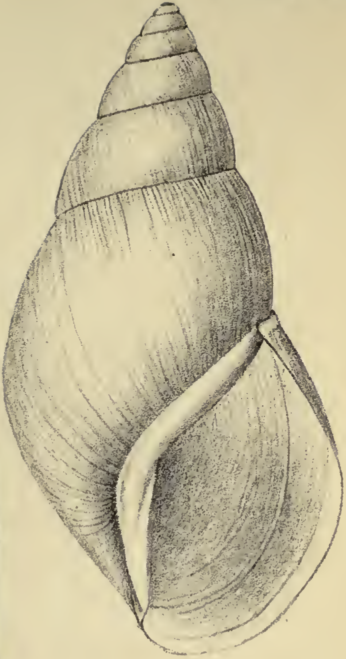


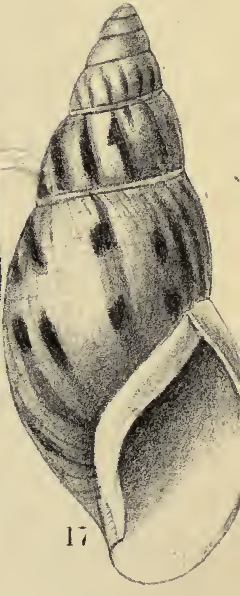
14

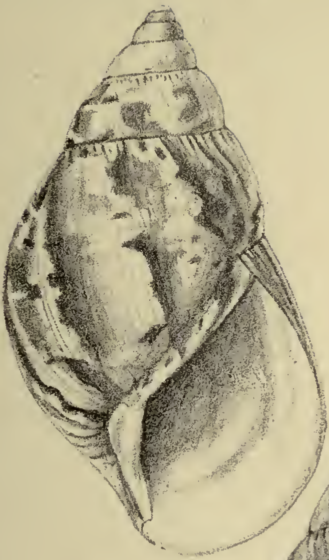


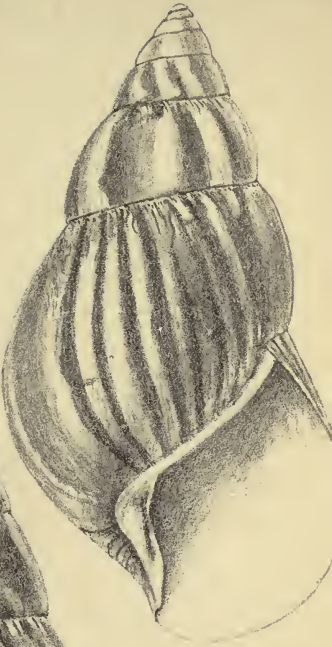
15

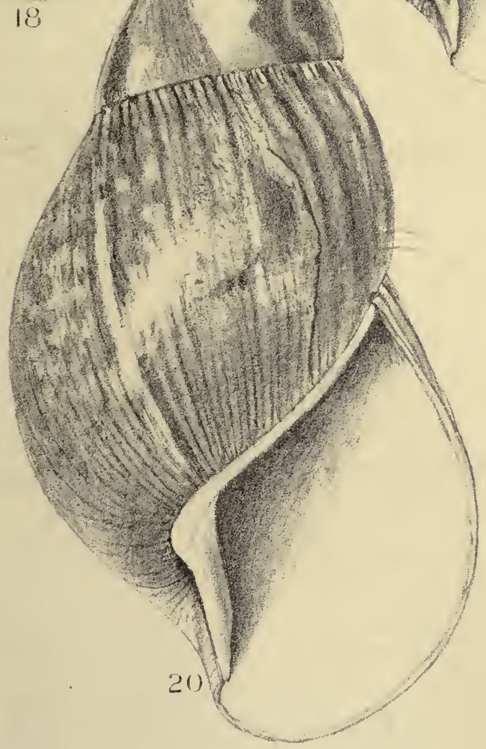

15

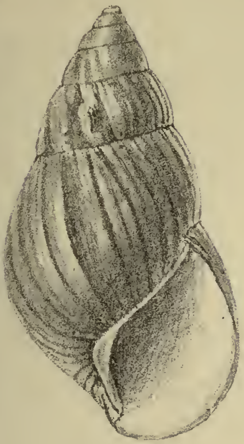

16


17

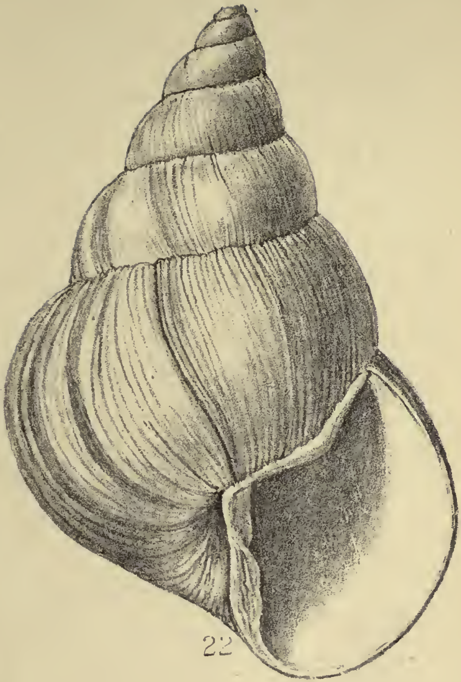

18


19

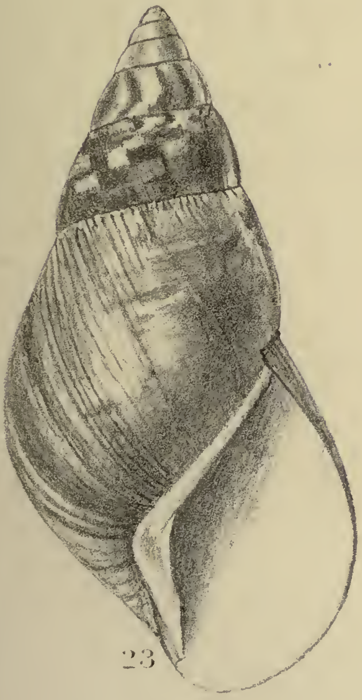

20



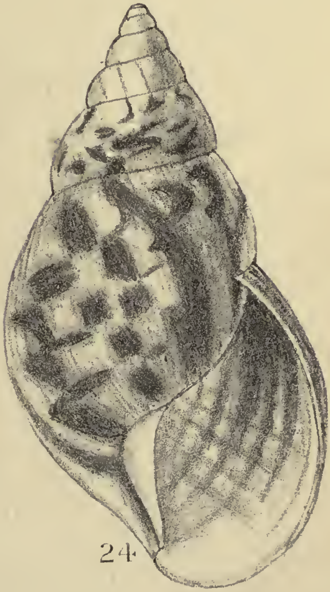
21



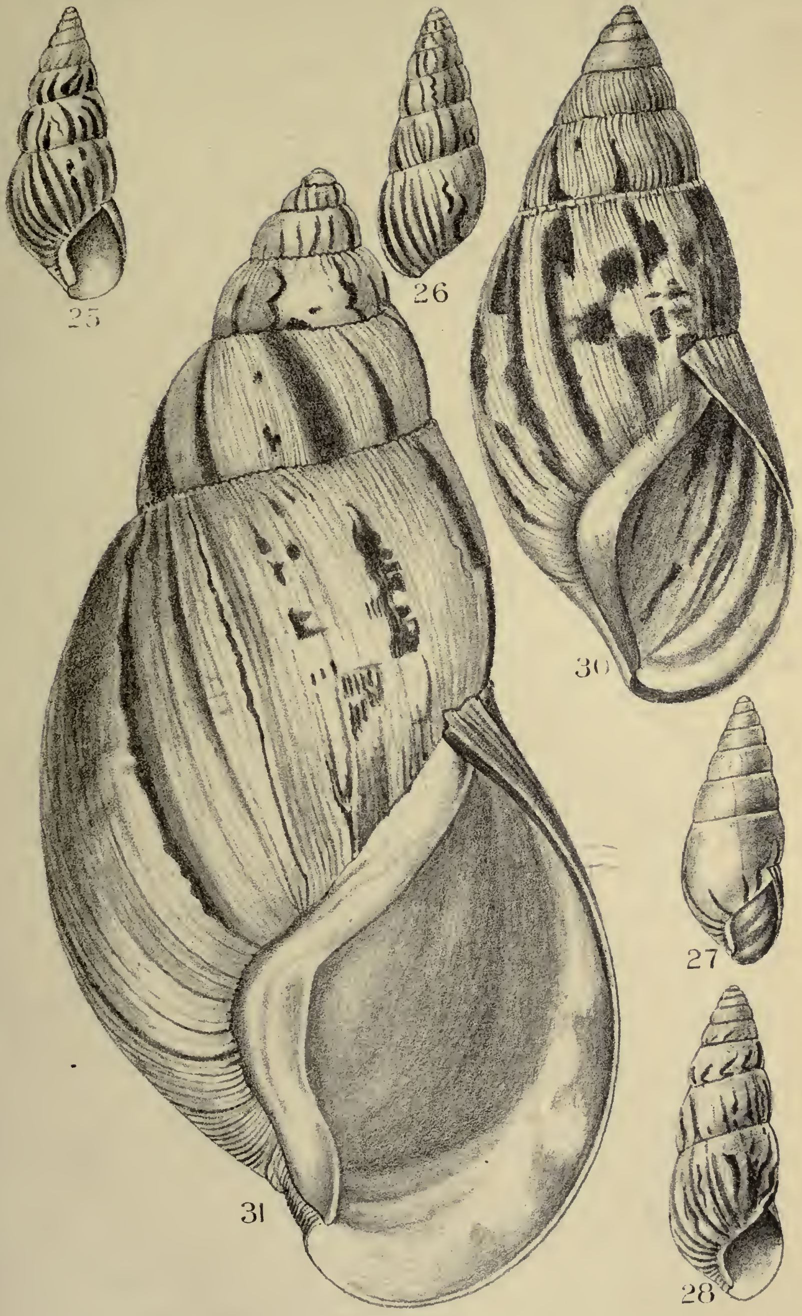
22



23

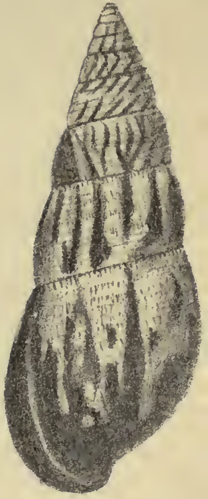


24

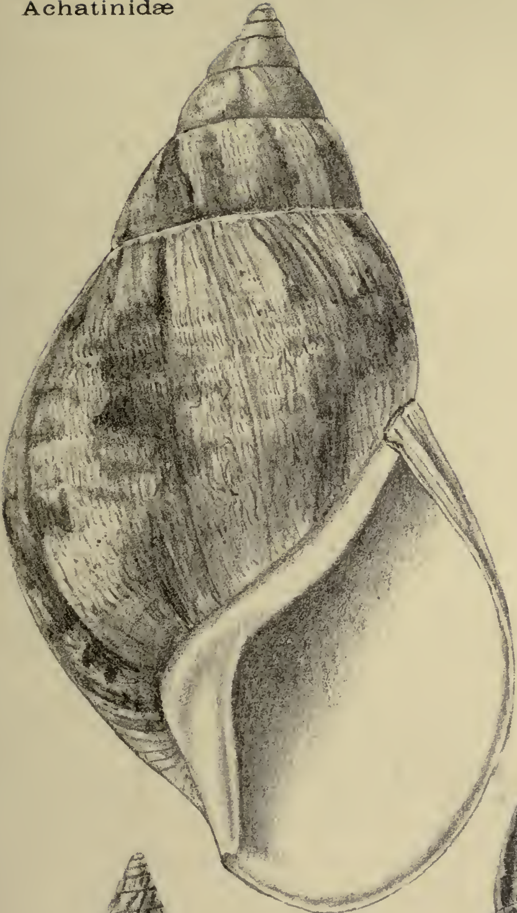

25
26
30
31
27
28

Achatinidæ

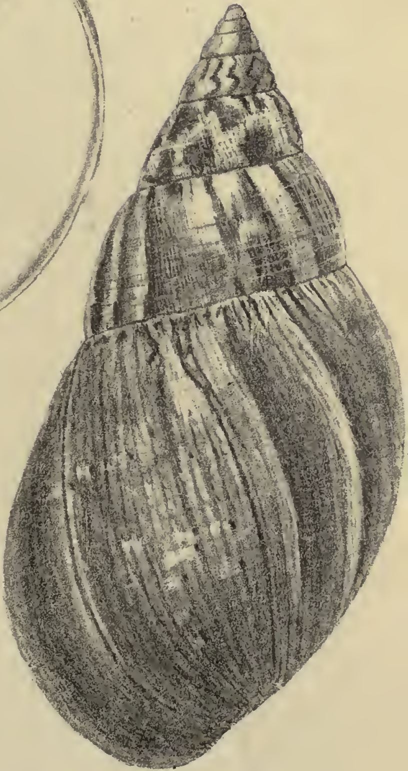
PLATE 3



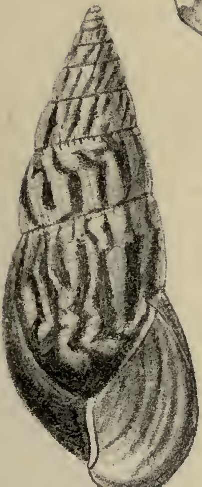
34



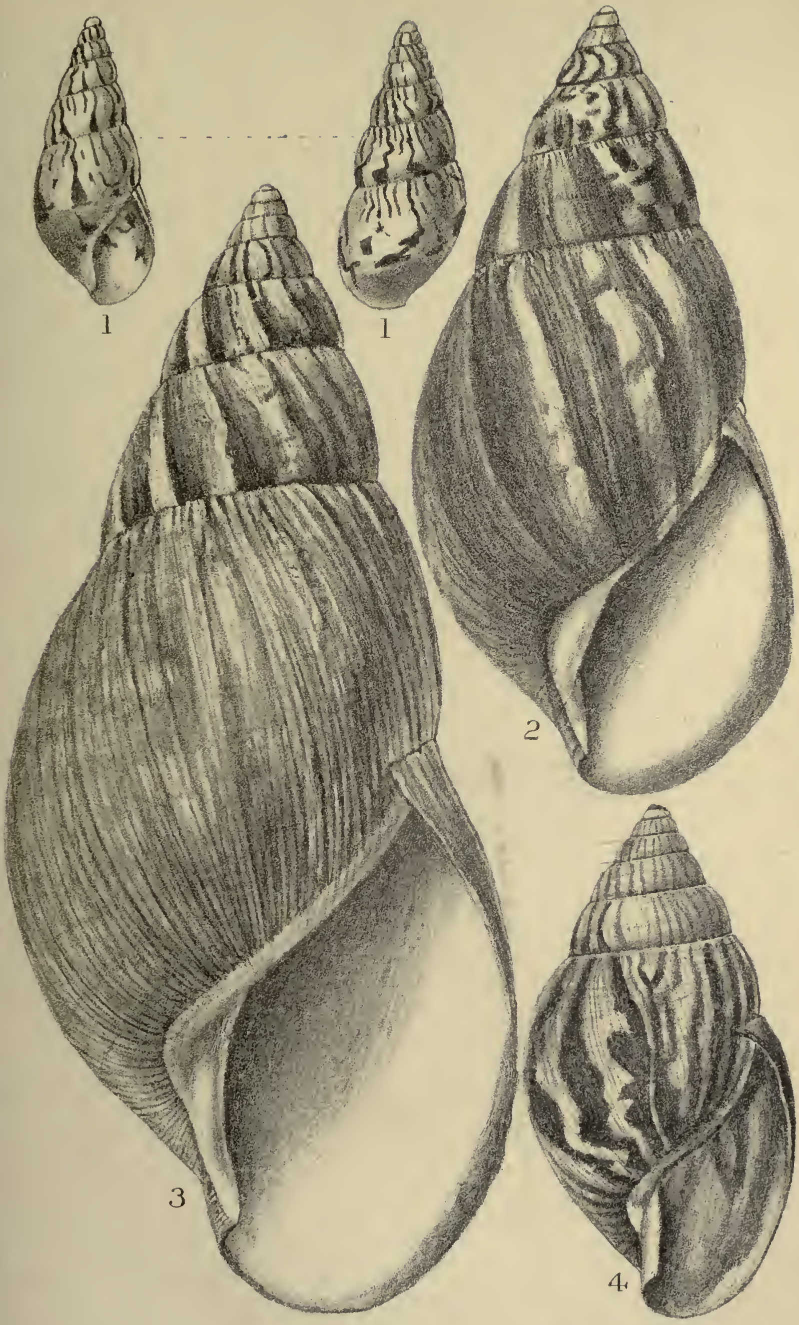
32

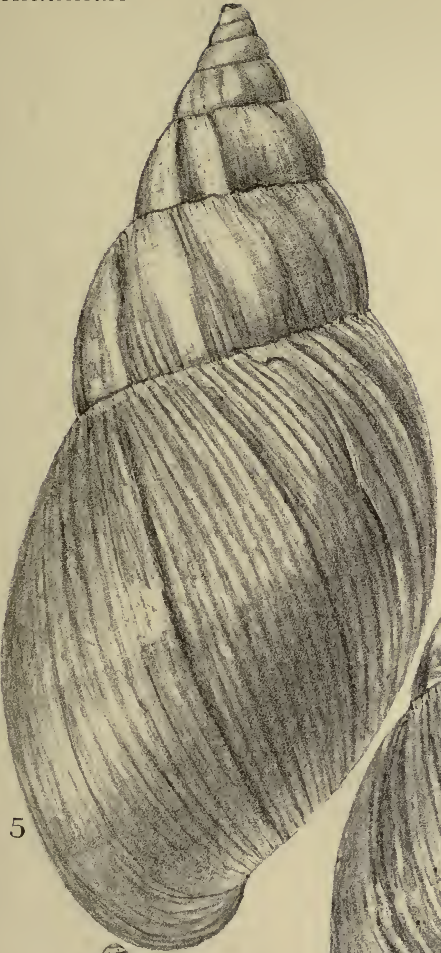


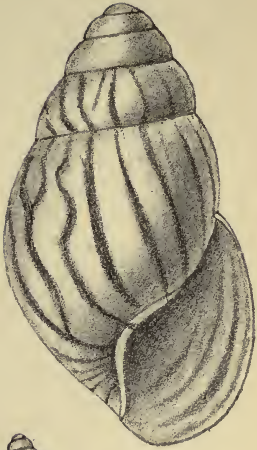
33

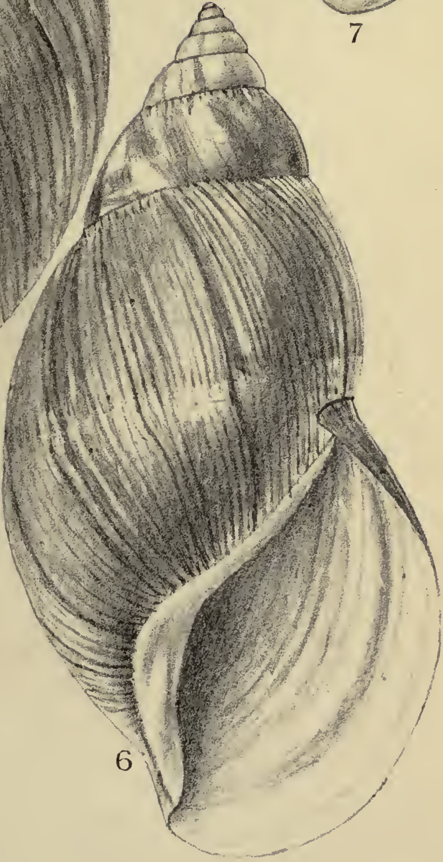


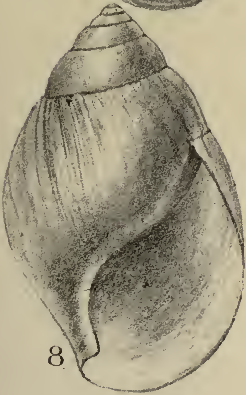
35

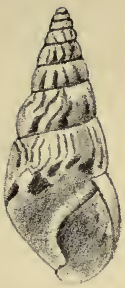

1
1
2
3
4


5

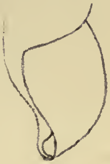

7


6

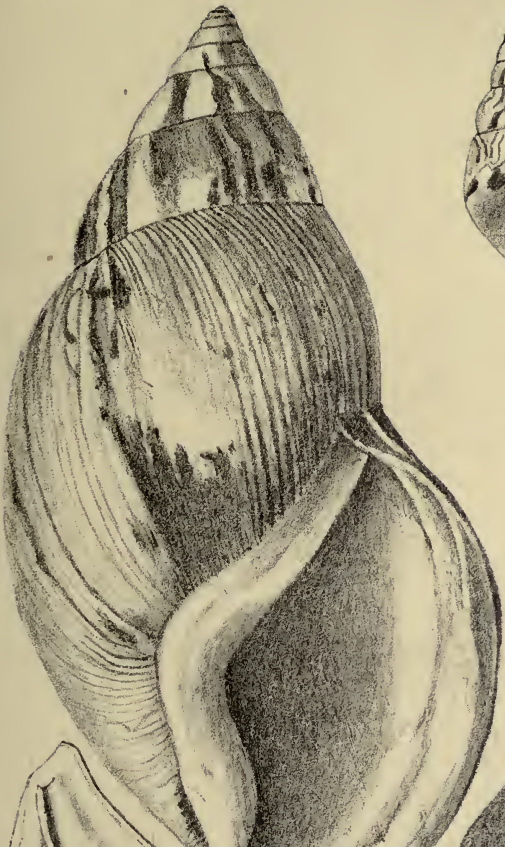

8



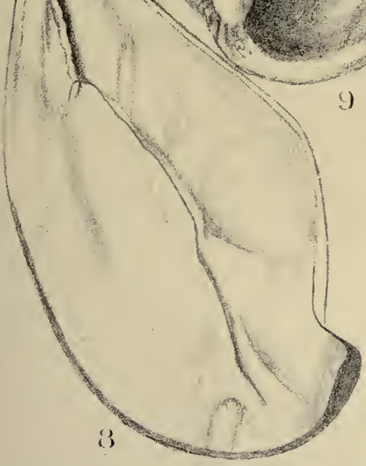
6



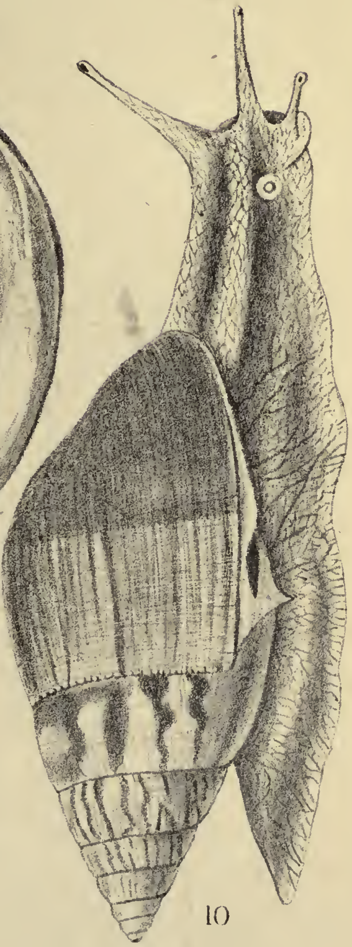
7



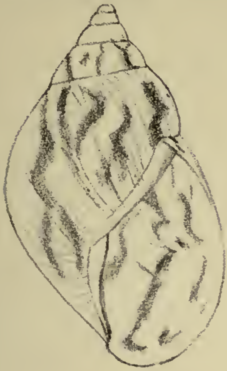
9



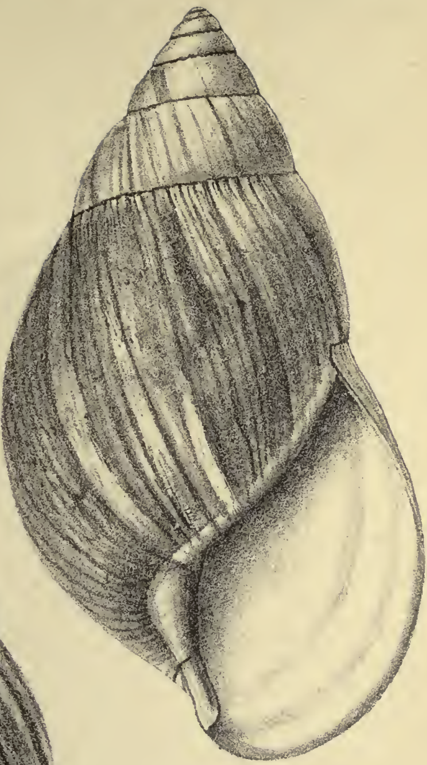
8



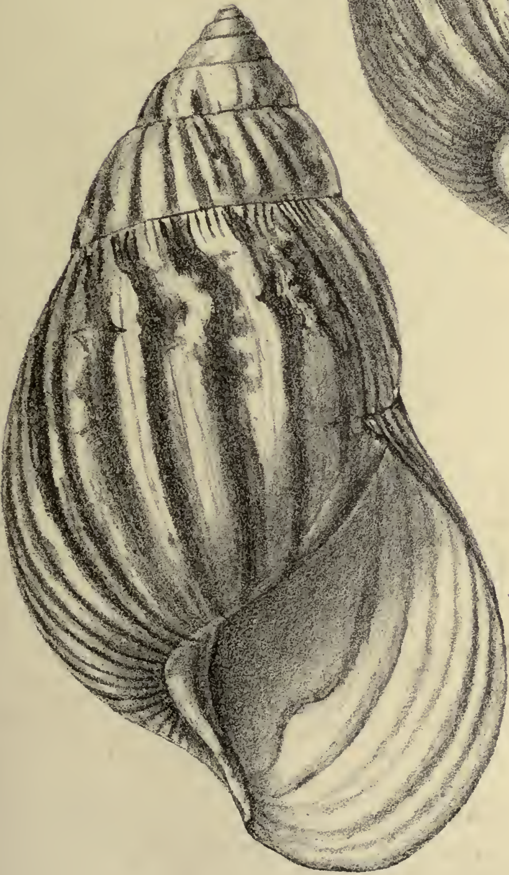
10



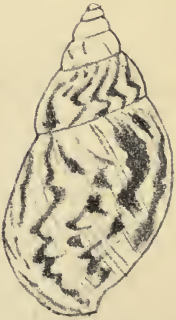
3



1



2



4

18-2137.

increasing, separated by a deep oblique suture, the two apical smooth, convex, tabulate above, forming an obtuse apex, the following 5-6 somewhat convex, the rest less convex, flattish, sculptured with slightly oblique striæ, close and peculiarly crenulated, the last angulated at the periphery, not descending; aperture angularly oval; peristome slender, simple; columellar margin narrowly reflexed.

"Length 37, diameter 6 mm.; aperture 5 mm. long and 3 broad." (*Smith*).

Sokotra (Mrs. Bent).

Stenogyra (*Riebeckia*) *insculpta* Smith, Journ. of Malacology vi, p. 37, pl. 5, f. 7 (Jan. 22, 1898); Nat. Hist. Sokotra, p. 136, fig.

"This species is remarkable for the peculiar sculpture, consisting of close-set slightly oblique raised lines of growth, which being crossed by numerous transverse impressed striæ, have a prettily festooned or crenulated appearance. It differs from *S. arguta* Martens, in sculpture, in the angulation of the body-whorl and more tapering form." (*Smith*).

7. R. ARGUTA (Martens). Pl. 55, figs. 89, 90.

Shell subulate-turrited, perforate, closely sharply vertically striate; white, usually with a ferruginous incrustation. Whorls 11, the first two forming an obtuse apex, smooth, the following regularly increasing, the upper whorls rather convex, the lower ones flattened, suture moderately impressed. Aperture occupying one-fourth the total length; outer margin thin, little arcuate; columellar margin reflexed, spirally entering above, tapering downwards. Length 20, diam. 5, length of aperture 5, width 3 mm. (*v. Marts.*)

Sokotra: Wady Kischen at 650 meters elev., and above up to 1000 meters, in crevices in the granite. Also at Keregnigi (Riebeck and Schweinfurth). Hadibu plain; Adho Dimellus, 3500-4500 ft.; Homhil, 1500-2500 ft. (Forbes exped.).

Stenogyra arguta v. Martens, Nachrbl. D. mal. Ges. 1881, p. 138; Conch. Mittheil. ii, p. 149, pl. 28, f. 17, 18—*S.* (R.) *arguta* Smith Nat. Hist. Sokotra, p. 136.—*Stenogyra jessica* Godwin-Austen, P. Z. S., 1881, p. 810, pl. 69, f. 3.—*Steno-*

gyra (*Opeas?*) *hirsutus* G.-A., t. c., p. 811, pl. 69, f. 6, 6*a*.—*S.* (*Balfouria*) *hirsuta* G.-A., CROSSE, Journ. de Conchyl. 1884, p. 356.

Mr. Smith writes of this species as follows: "After carefully examining the types of *S. jessica* and *S. hirsutus*, and the series of specimens obtained by Dr. Forbes and Mr. Grant, I feel convinced that only one species is represented. The types of *S. jessica* are worn bleached shells which have lost the 'hairs' retained by *S. hirsutus*, the unique type of which is merely a very young shell, but in fresh condition. This was commented upon by Martens when describing his *S. arguta*. Specimens vary somewhat in form, some being longer and more slender than others. The specimen examined is 23 mm. long and 6 broad. A shorter example is 17 in length and 5½ in diameter. One of the specimens from Homhil is in perfect condition, being clothed with a beautiful hairy periostracum, the 'hairs' being arranged in rows upon the lines of growth, and longer than in the type."

The original descriptions of *S. jessica* and *S. hirsutus* follow:

S. jessica (pl. 55, fig. 93). "Shell elongately turreted, dextral, decollate in the three specimens obtained, scarcely rimate; sculpture very fine longitudinal ribbing; color white; spire long, with sides flatly convex; suture very shallow; whorls 8+; sides very flat; aperture oval, oblique, angulate above; peristome thin; columellar margin weak and but slightly reflected. Length 19.2, diam. 5.3, alt. of aperture 5 mm." (*G.-A.*)

Not very common, on the limestone-ridge S. W. of Gollonsir, at high altitudes; at 1000 ft. on south side of the island. (Balfour.)

S. hirsutus (pl. 55, figs. 91, 92). "Shell dextral, elongately turreted, scarcely rimate, covered with a thick epidermis; sculpture a rough surface with regularly disposed longitudinal lines of fine hairs (fig. 92); color dull ochre; spire elongate, sides flat, apex blunt, suture well impressed; whorls 11, sides slightly convex; aperture oval, oblique; peristome thin; columellar margin thin, slightly reflected. Length 11, diam. 3, alt. of aperture 2 mm." (*G. A.*).

Found underneath granite boulders on hills above Adona, altitude over 2000 feet (Balfour).

S. hirsutus is the type and only species of the undefined section *Balfouria* Crosse, 1884.

Genus RUMINA Risso, 1826.

Rumina Risso, Hist. Nat. Eur. Mérid., iv, p. 79, for *R. decollata* L.—*Orbitina* Risso, t. c., p. 82 (young of *R. decollata*).—*Cylindrina* Schlueter, Syst. Verzeich., p. 7, 1838, for *C. decollata.*—*Sira* A. Schmidt, Der Geschlechtsapparat der Stylommatophoren in taxonomischer Hinsicht, in Abhandl. naturwiss. Vereins für Sachsen u. Thüringen in Halle, i, p. 42 (1855), type *S. decollata*. *Stenogyra* of many authors.

Shell perforate, cylindric or tapering, 4 to 7 whorls remaining in adults in which the summit is truncate and closed by a spiral convex septum; about 8 to 10 whorls having been lost by successive breakages. Aperture subvertical, ovate, the outer lip simple, obtuse; columella vertical, slightly concave, continuous with the basal lip; columellar margin reflexed. Apex globular, smooth, fine striæ appearing on the third whorl; young shells with concave lateral outlines.

Genitalia (pl. 65, fig. 46, x 3). The penis is a rather slender sack, with terminal retractor and vas deferens, the latter imbedded in its integument. The vagina is longer than the penis; duct of the spermatheca short.

The pallial organs (pl. 65, fig. 44, x 3) resemble those of *Limicolaria* and *Achatina* in the type of venation of the lung, but differ in the much shorter kidney (*k*), less than double the length of the pericardium. The secondary or gut ureter (*s. u.*) is closed.

The right ocular and tentacular muscles are united proximally with the columellar muscle. The pharyngeal retractor unites with the left ocular band (pl. 65, fig. 45). The retractor of the penis is a branch of the right ocular band. The salivary glands are united around the œsophagus (pl. 65, figs. 43, 44, *s. gl.*).

The jaw is arcuate, with rather weak vertical striæ.

The radula (page ix, fig. 5) has a narrow tricuspid central tooth, and tricuspid laterals. The marginal teeth are formed by suppression of the entocone, being thus bicuspid.

The eggs are globular, white, and about 2.5 mm. diam.

Distribution, Mediterranean region, in Europe, Asia and Africa.

This genus is apparently related to *Homorus* and to the tropical American *Stenogyra* (*S. obeliscus*, etc.), with both of which it agrees in the structure of the embryonic shell and in dentition. The soft anatomy of *Homorus*, the large *Stenogyras* and *Riebeckia* is not sufficiently known for any exact comparisons. *Rumina* is undoubtedly a genus of African origin. Where it occurs, it lives in profusion, so that the absence of so conspicuous a snail from European tertiary deposits seems to signify a geologically recent advent of the genus in Europe.

With the normal Achatinoid musculature of the penis, *Rumina* has not the penial complications of *Achatina* and its immediate relatives.

R. DECOLLATA (Linné). Plate 53; pl. 55, fig. 99.

Shell narrowly rimate, cylindric or cylindric-tapering, truncate and closed by a spiral convex plug at the summit; rather thin, glossy, pale flesh-tinted or whitish, the young light brown. Surface irregularly striate, distinctly so below the suture, more or less malleate, and usually showing some spiral lines of vertical punctures. 4 to 6 whorls usually remain in adults; they are but slightly convex. Aperture ovate, the outer lip simple, more or less thickened within; columella vertical, nearly straight, its edge reflexed above, almost closing the minute umbilical crevice. Length 30, diam. 11-12 mm.

Entire Mediterranean region, the typical forms from southern France, Italy, Sicily, Canary Is. Introduced in the Azores, Madeira and Cape Verde Is., Bermuda, Santo Domingo, Cuba (Havana), Charleston, South Carolina.

Helix decollata L., Syst. Nat. (10), p. 773.—*Bulimus decollatus* BRUG., Encycl. Méth., i, p. 326.—PFEIFFER, Monogr. Hel. Viv., ii, 152; iii, 397; iv, 456; vi, 94; viii, 130.—LOWE, Journ. Linn. Soc., v, 1861, p. 202, with var. *lævigata* and var.

decussata, p. 203.—BOURGUIGNAT, Malacologie de l'Algerie, ii, 1864, p. 3, pl. 1, f. 1-21 (varieties).—*Stenogyra d.* var. *claviformis* KOB., Jahrb., ix, 1882, p. 71.—*Cf.* Zool. Rec., 1898, p. 60 (cerebral ganglia); Wiegmann in Weber's Zool. Ergebnisse einer Reise in Niederländisch Ost-Indien, iii, pp. 220, 221 (anatomy). Binney, Terrestrial Mollusks, v, p. 192, pl. 50, f. 1 (shell), pl. iv, f. Q (teeth).—*Rumina decollata* RISSO, Hist. Nat. Eur. Mérid., iv, p. 79.—FISCHER & CROSSE, Moll. Mex., i, p. 630, pl. 28, f. 16, 17 (teeth).—*Stenogyra decollata* L., KOBELT in Rossmassler's Iconogr. n. F., i, p. 54, pl. 20, f. 157-167 (varieties); Supplem., p. 59, pl. 21, f. 6, 7 (Cyprus); Nachbl. D. M. Ges., 1885, p. 42 (large form).—*Bulimus multilatus* SAY, Journ. Acad. Nat. Sci. Phila., ii, p. 373 (1822).—*B. "mutilatus* Say" Binney, The Complete Writings of Thomas Say, p. 25 (1858).—*Bulimus truncatus* Zgl., teste MOUSSON, Malak. Bl., 1856, p. 177; Jahrb., i, p. 93.—*Bulimus paivæ* LOWE, Journal and Proc. Linnean Soc., v, 1861, p. 201.

Orbitina truncatella RISSO, t. c., p. 82, pl. 3, f. 25, and *O. incomparabilis* RISSO, p. 82, pl. 3, f. 23 (young).—*Bulimus decapitatus* SPIX, Testac. Bras., p. 8, pl. 8, f. 3.

The references could be greatly extended, only a few leading ones appearing above. For others see Pfr., Kobelt, *et al.*

There are three subspecies of *R. decollata:* (1) the large African form, further distinguished by its decussated surface; (2) the South European typical form, Spain to Sicily, of moderate size, malleated; and (3) the small, slender form of Greece and the eastern shores of the Mediterranean.

Subspecies PAIVÆ Lowe. Pl. 53, all figs. except 63 and 70.

Shell *large or very large*, robust, and usually conspicuously *decussated on the spire.* This is the African race, Morocco to Algeria. Various local varieties have been defined. In addition to the following, I find a var. *saharica* Deb. from southern Morocco mentioned (J. de C., xlvi, p. 161), but have seen no description or figure of it. *Rumina atlantica* Pallary, Mém. Soc. Geol. France, Paleontology, ix, 1901, is a fossil form apparently referable to *paivæ*. Pfeiffer in 1848 (Monographia, ii, p. 153) applied the term "major" to large *decollata*, but he did not use it in a binomial or trinomial sense, and it is preoccupied.

(1) Var. *maxima* Bgt., pl. 53, figs. 65, 66, very large and cylindric, the spiral sculpture very distinct, length 45 to 60 mm. It is widely distributed in the province of Oran.

(2) Var. *lanceolata* Bgt., pl. 53, fig. 69, is large, lanceolate, from La Calle, near Algiers, Batna, etc.

(3) Var. *ventricosa* Bgt., pl. 53, figs. 64, 68, ventricose at base, the spire acuminate. Environs of Oran, in the mountains (fig. 68); Sidi-bel-Abbes (fig. 64).

(4) Var. *cornea* Bgt., of a very dark corneous tint. Mostaghanem, Boghar, etc.

(5) Var. *flammulata* Bgt., pl. 53, figs. 71, 72, whitish with corneous flammules. Oran, Bougie.

(6) Var. *paivæ* Lowe. Livid or purplish brown or fawn-color, also within the mouth; thick, strong and heavy; whole surface equably and finely decussated with spiral lines crossing the close, distinct and even striæ of growth, which are not conspicuously stronger at the sutures as they are in typical *decollata*. 39-44 x 16 mm., apert. 13-14 mm. long. Rabat, Morocco (Lowe). *R. decollata* var. *maura* Crosse (J. de C., 1873, 137), pl. 53, fig. 60, 50 mm. long, is identical. Kobelt also figures specimens referable to *maura* from Nemours, western Algeria (pl. 53, fig. 61), and the var. *fusca* Pallary (J. de C., xlvi, 1898, p. 123) from Tetuan, etc., is probably allied or identical.

(7) Var. *claviformis* Kobelt, pl. 53, fig. 62, is a further development of *paivæ*, from which it differs in the club-like shape. It is from Nemours.

(8) Var. *decussata* Lowe. Shell similar to typical *decollata* in color and appearance, but it is in the average more robust, with a well-developed parietal callous, *the surface more closely and deeply decussated*, like the African forms. Rome, Malta, southern Spain, Canary Is. This race, defined by Lowe in 1861, is generally distinguishable. The specimens from Rome may be descendants of Carthaginian examples, introduced about 2000 years ago. Those of Malta and southern Spain probably indicate former geographic relations with Africa.

Subsp. DECOLLATA (L.). Pl. 53, fig. 70; pl. 55, fig. 99.

The surface is malleated but scarcely decussate, there being some spiral rows of vertical impressions only; the size is moderate, about 24 to 30 mm. long, the diam. generally exceeding one-third the length. This is the form of southern France (fig. 70), etc., and which has been spread by commerce in the islands of the Atlantic and as far as America. The specimens before me from the Canaries seem also to be of this stock. Also the form of southern Spain (pl. 53, fig. 63, Terragona; after Kobelt); but var. *decussata* is also reported from Spain.

The anatomy of a specimen from Malta is figured; see under the generic description. The count of teeth of the radula varies, Fischer giving it as 50, 1, 50; Wiegmann as 42, 1, 42; and Binney as 38, 1, 38. The radula I examined was frayed at the edges.

Subsp. GRACILIS Pfr. Pl. 55, figs. 1, 2, 3.

Shell corneous-brown or whitish-corneous, with the sculpture of typical *decollata*, but *small and very narrow*, and either cylindric or tapering. Whorls usually more numerous, 6-7. Length 20, diam. 8 mm. with 4 whorls; 27 x 8 mm. with 6 whorls (measurement to outer edge of lip).

Greece (Patras, Athens, etc.), Crete (figs. 1, 3), Naxos, Rhodes (fig. 2), Cyprus, Smyrna, and the Syrian coast generally.

Bul. decollatus var. *gracilis* PFR., Mal. Bl., iii, 1857, p. 177. Smyrna (*Bul. truncatus* Ziegler in Mousson, according to Pfr., *l. c.*). Not *Bul. truncatus* Brug.—*Bul. decollatus* var. *minor* Bgt., Malac. de l'Algerie, ii, p. 6, pl. 1, f. 14, 15 (Smyrna), f. 16 (Algeria), f. 17 (Syria). 1864.

This small, cylindric, Eastern race is apparently separated from the typical *decollata* by an area without *Rumina* along the western coast of the Adriatic. It is reported from several Algerian localities by Bourguignat, but whether these shells are another and parallel small race remains to be ascertained.

APPENDIX.

TRICHODINA Ancey (p. 182).

Dall has shown that this name is preoccupied. It was used by Ehrenberg in 1830 for an infusorian (not a foraminifer, as he states). He therefore proposes to substitute the term *Petriola* (Nautilus, xviii, April, 1905, p. 143). This necessitates a change in the arrangement of my text. The groups should stand thus:

Genus BOCAGEIA Girard (p. 191), type *lotophaga.*
Subg. PETRIOLA Dall, type *marmorea.*

ACHATINA LEUCOSTYLA Pils. Page 45.

This form proves to be so different in genitalia from *A. panthera* that it will stand as a species. See anatomical notes in introductory pages of this volume.

Achatina (*Liguus*) *unizonata* Cristofori et Jan. Shell conic-ovate, ventricose, smooth, whitish, zoned with a brown line; interior margin of the columellar lip white, outer brown. 1 inch 10 lines high, 1 inch wide, aperture 11 lines long, 6 wide. South America. (Catalogus, etc., sect. ii, part 1, p. 4; Mantissa, p. 2, no. 7-4. 1832).

Probably a synonym of *Liguus fasciatus.*

Chersina imperialis Beck, Index Moll., p. 74. "Afr. oc." Nude name = *Pseudotrochus.*

Achatina serpentina Beck, Index Moll., p. 76. Afric. occid. (?). Nude name.

Atopocochlis exarata (Müll.). Vol. xvi, p. 218. Add the synonyms: *Bulimus crystallinus* Greef, Zool. Anzeiger, 1882, p. 520, and *Pseudachatina vitrea* Greef, Sitzungsber. Ges. zu Marburg, 1884, p. 51. See Jornal de Cien. Math., Phys. e Nat. Lisboa, iii, 1893, p. 38.

LIMICOLARIA JOUBINI Rochebrune et Germain.

Shell perforate (perforation half covered), ovoid oblong, rather solid, opaque, finely striatulate, pale ochraceous, irregularly ornamented here and there with wine-violet flammules. Spire oblong, obtuse at the summit, the apex smooth. Whorls

7, a little convex, slowly and regularly increasing, separated by a somewhat impressed suture, the last whorl convex, occupying three-fifths the length. Aperture suboblique, semilunate, elongate, acutely angulate above, subangular below at the base of the columella, moderately convex outwardly. Peristome unexpanded, acute; columella straight, dilated above, tapering downwards. Length 44 to 46, diam. 22 to 24.5 mm.; aperture alt. 18, diam. 11.5 mm. (*Rochbr. et Germ.*).

Congo valley: between the rivers Aba and Dongou, at an elevation of 1100 meters.

Limicotaria joubini R. et G., Bull. du Mus. d'Hist. Nat. (Paris), 1904, p. 142.

LIMICOLARIA CENTRALIS Germain.

This species belongs to the series of large Limicolarias of the group of *L. turriformis* Martens, but is distinguished from the latter by its shape, being more enlarged at the base, relatively less long with an equal diameter; by the more rapid increase of the spire, composed of only 9 whorls, which are much less convex, the profile being nearly flat; the last whorl is relatively more developed, .64 of the total length (while in *turriformis* it is only .57). The sutures are less deep; the aperture is larger, the columella more strongly plicate, the umbilicus larger, and bounded by a stronger angle. This species is particularly notable for its Glandiniform appearance. It reaches the following dimensions: length 79, greatest width 33.5, height of aperture 37, width 18 mm.

French Soudan, along the bend of the Niger (General de Trentinian, 1898).

L. centralis Germ., Bull. du Muséum d'Histoire Naturelle, année 1904. no. 7, p. 467.

Germain's description, given above, has not been illustrated. The species may be placed next to *L. kambeul* (vol. xvi, p. 251).

INDEX TO GENERA AND SUBGENERA CONTAINED IN VOL. XVII.

[The names of synonyms are distinguished by *Italic* type.]

Achatina Lam., 1.
Achatinus Montf., 1.
Achatium Link, 1, 3.
Ampulla Bolt., 1, 3.
Archachatina Alb., 104.
Balfouria Crosse, 204.
Bocageia Gir., 182, 191.
Bulimus auct., 171, 192, 212.
Callistopepla Anc., 125.
Callistoplepa Anc., 125.
Ceras D. & P., 155.
Chersina Humph., 1.
Chilonopsis F. de W., 171.
Clavator Marts., 192.
Cochlitoma Fér., 76.
Columna Perry, 120.
Ganomidos d'Ailly, 125.
Homorus Alb., 130.
Leptocala Anc., 72.
Leptocallista Pils., 75.
Obeliscus auct., 192.
Oncaea Gist., 1, 71.
Pachyotus auct., 171.
Parachatina Bgt., 1, 5.
Petitia Jouss., 72.
Petriola Dall, 216.
Pintoa Bgt., 24.
Pseudoglessula Bttg., 156.
Riebeckia Marts., 204.
Rumina Risso, 212.
Serpæa Bgt., 1, 21.
Stenogyra auct., 204.
Subulina auct., 130.
Subulona Marts., 138.
Trichodina, Anc., 182, 216.
Tripachatina Bgt., 5.
Urceus Klein, 1.

REFERENCE TO PLATES.

VOL. XVII.

PLATE 1.

FIGURE	PAGE
1, 3. Pseudotrochus alabaster Rang. After Semper	x
2. Pseudotrochus alabaster Rang. After Rang	x
4, 5. Pseudotrochus auripigmentum Rve. After Furtado.	x
6-9. Atopocochlis exarata Müll. After Furtado	x
(*a*, exit of vas deferens from the penis sheath. *b*, entrance of v. d. into penis sheath. *cd*, vas deferens. *ce*, ovisperm duct. *ed*, vas deferens. *ga*, albumen gland. *gp*, sheath of the penis. *gh*, hermaphrodite gland. *m*, retractor muscle. *o*, oviduct. *op*, atrum. *p*, penis. *sp*, spermatheca. *u*, uterus. *v*, vagina.)	

PLATE 2.

10. Achatina welwitschi Morel. After Morelet	17
11, 12. Achatina paivana Morel. After Morelet	17
13, 14. Achatina tavaresiana Morel. After Morelet	21
15, 16. Leptocala specularis Morel. After Morelet	74

PLATE 3.

17, 18, 19. Achatina bayaona Morel. After Morelet	20
20, 21. Achatina bandeirana Morel. After Morelet	19

PLATE 4.

22, 23. Achatina infrafusca Martens. Conch. Mittheil.	32
24, 25. Achatina colubrina Morel. Voy. Welwitsch	27
26. Achatina perfecta Morel. Voy. Welwitsch	15
27. Achatina balteata Rve. C. Icon.	30

FIGURE PAGE

PLATE 5.

1. Cochlitoma schenckii Mart. Conch. Mittheil.......... 96
2-5. Achatina polychroa Morel. Voy. Welwitsch....... 26
6. Achatina monetaria Morel. Voy. Welwitsch......... 19

PLATE 6.

7, 8, 9. Achatina hortensiæ Morel. Voy. Welwitsch..... 22
10. Achatina indotata Rve. C. Icon.................. 83
11, 12. Achatina buechneri Marts. C. Mittheil......... 10
13, 14. Achatina zebriolata Morel. Voy. Welwitsch..... 26

PLATE 7.

15. Achatina schweinfurthi Marts. Novit. Conch....... 61
16-18. Achatina craveni Smith. P. Z. S............... 66

PLATE 8.

19, 20. Achatina glaucina Anc. P. Z. S. 64
21. Achatina hamillei Pet. J. de Conch................ 53
22. Achatina hamillei var. P. Z. S.................... 54

PLATE 9.

23, 24. Achatina glutinosa Pfr. After Pfeiffer........ 61
25, 26. Achatina fragilis Sm. P. Z. S. 63

PLATE 10.

27, 28. Achatina semisculpta Pfr. Moll. Guin. Inf. 15
29. Achatina semisculpta Pfr. C. Icon................ 15
30, 31. Achatina dohrniana Pfr. Novit. Conch......... 18

PLATE 11.

32, 33. Achatina dammarensis Pfr. Novit. Conch. 21
34. Achatina thomsoni Sm. P. Z. S.................... 69
35. Achatina immaculata Lam. Fér., Hist. 50
36. Achatina smithii Craven. P. Z. S................. 91

PLATE 12.

37. Cochlitoma simplex Smith. Specimen............. 98
38. Cochlitoma parthenia M. & P. Am. Mag........... 100
39. Achatina layardi Pfr. Novit. Conch. 51
40, 41. Achatina johnsoni Sm. P. Z. S................ 65

FIGURE PAGE

PLATE 13.

42. Achatina randabeli Bgt. Moll. Afr. Equat. 69
43. Achatina albopicta Sm. After Ancey 88
44. Achatina bisculpta Smith. After Ancey 94
45. Achatina mariei Ancey. After Ancey 37

PLATE 14.

1. Cochlitoma livingstoni M. & P. Am. Mag. 104
2. Achatina arctespira Bgt. Moll. Afr. Equat. 67
3. Achatina ellioti Sm. Proc. Mal. Soc. 71
4. Achatina milneedwardsiana Riv. Bull. Soc. Mal. 38

PLATE 15.

5, 6. Achatina fulminatrix Marts. D. Ost-Afr. 67
7, 9. Achatina castanea Lam. D. Ost-Afr. 54
8. Achatina castanea Lam. Fér., Hist. 54

PLATE 16.

10. Cochlitoma kraussii Rve. Specimen 87
11. Cochlitoma kraussii Rve. Conch. Syst. 87
12. Achatina lactea Rve. Conch. Syst. 35
13. Achatina chrysoleuca Pils. Specimen 59

PLATE 17.

14, 15. Achatina sylvatica Putz. Specimens 28
16. Achatina sylvatica Putz. After Putzeys 28
17. Achatina weynesi Dautz. After Dautzenberg 11
18. Achatina iostoma Pfr. Conch. Cab. 32
19. Achatina schinziana Mouss. J. de Conch. 16

PLATE 18.

21. Achatina tincta Reeve. Malak. Bl. 12
22. Achatina tincta Reeve. Conch. Icon. 12
23. Achatina tincta Reeve, type. Conch. Syst. 12
20. Achatina oblitterata Dautz. After Dautzenberg 13

PLATE 19.

24, 25. Achatina oblitterata Dautz. Malak. Bl. 13
26, 27. Archachatina bicarinata carnea. Novit. Conch... 107
28, 29. Achatina ivensi = pfeifferi. J. de Conch. 25
30. Achatina albicans Pfr. Conch. Cab. 23

FIGURE PAGE

Plate 20.

1-3. Archachatina knorri Jonas. Specimens........... 118
4, 5. Archachatina papyracea adelinæ Pils. Specimens. 118

Plate 21.

6, 7. Archachatina purpurea Gmel. Specimens......... 114
8. Archachatina ventricosa Gld. Specimens........... 113

Plate 22.

9, 10. Archachatina bayoli Morel. J. de Conch......... 118
11. Archachatina rhodostoma Phil. Abbild............ 115
12. Archachatina rhodostoma splendida Pils. Specimen. 116

Plate 23.

13-16. Archachatina camerunensis Ailly. After d'Ailly. 119
17, 18. Archachatina papyracea Pfr. Conch. Cab....... 117
19. Archachatina ventricosa Gld. Specimen........... 113

Plate 24.

20, 21. Archachatina ovum Pfr. Novit. Conch......... 111
22, 23. Archachatina marginata Swains. Specimens.... 109

Plate 25.

24. Archachatina siderata Rve. Conch. Icon.......... 117
25. Archachatina subsuturalis Pils. Abbild........... 111
26. Archachatina marginata Swains. Specimen........ 109

Plate 26.

27. Cochlitoma crawfordi Morel. J. de C.............. 93
28. Cochlitoma crawfordi Morel. Specimen........... 93
29. Cochlitoma aedigyra M. & P. Ann. and Mag........ 94
30, 31. Cochlitoma varicosa Pfr. Malak. Bl............ 92
32, 33. Cochlitoma varicosa Pfr. Novit. Conch......... 92

Plate 27.

34. Cochlitoma fulgurata Pfr. Conch. Cab............ 85
35. Cochlitoma zebra obesa Pfr. Specimen............ 86
36. Cochlitoma kraussi Rve. Conch. Icon............. 87
37. Cochlitoma rhabdota M. & P. Ann and Mag....... 91

FIGURE PAGE

Plate 28.

38. Cochlitoma ustulata Lam. Fér., Hist. 89
39. Cochlitoma zebra Brug. Conch. Icon. 85
40. Cochlitoma penestes M. & P. Ann. and Mag. 100
41. Cochlitoma delorioli Boumet. Rev. et Mag. 82

Plate 29.

42. Cochlitoma cinnamomea M. & P. Ann. and Mag. 94
43. Cochlitoma linteræ Sowb. P. Z. S. 102
44. Cochlitoma granulata Krauss. Specimen 79
45. Cochlitoma ustulata Lam. Conch. Syst. 89

Plate 30.

46, 47. Cochlitoma vestita Pfr. Novit. Conch. 81
48, 49. Conchlitoma vestita Pfr. Specimen 81
50. Cochlitoma pentheri Stur. After Sturany 81
51, 52. Cochlitoma semidecussata Mke. Abbild. 80
53. Cochlitoma semidecussata Mke. Specimen 80

Plate 31.

1. Achatina achatina L. Specimen 9

Plate 32.

3. Achatina monochromatica Pils. Specimen 10
4. Cochlitoma drakensbergensis M. & P. Ann. and Mag. 103
5. Cochlitoma burnupi M. & P. Specimen 97
6. Cochlitoma dimidiata Sm. Specimen 95

Plate 33.

7. Cochlitoma churchilliana M. & P. Ann. and Mag. 101
8, 9. Achatina rugosa Putz. Specimens 30
10. Cochlitoma churchilliana M. & P. Specimens 101

Plate 34.

11. Cochlitoma scaevola M. & P. Ann. and Mag. 98
12. Cochlitoma rugosa Putz. After Putzeys 30
13. Cochlitoma stuhlmanni Marts. D. Ost-Afr. 68
14. Leptocala pulchella Marts. Monatsbericht 73
15. Leptocala petitia Jouss. Bull. Soc. Zool. Fr. 73

FIGURE PAGE

PLATE 35.

15. Achatina reticulata Pfr. C. Cab.................. 34
16. Achatina antourtourensis Cr. Moll. Madag........ 46
17. Achatina allisa Rve. C. Icon...................... 33

PLATE 36.

18. Achatina fulica Fér. "W. Africa." Specimen...55, 57
19. Achatina fulica Fér. Mauritius. Typical specimen. 55
20. Achatina fulica Fér. Madagascar. Specimen.....55, 57

PLATE 37.

21. Achatina fulica coloba Pils. Specimen............ 58
22. Achatina fulica, pathologic, v. d. Decken's Reise.... 58
23. Achatina fulica Fér. Calcutta. Specimen......... 55
24. Achatina fulica Fér. C. Icon...................... 57

PLATE 38.

25-27. Achatina pfeifferi Dkr. Phil., Abbild.......... 24
28. Achatina pfeifferi Dkr. Specimen.................. 24
30. Achatina panthera var., Zomba. P. Z. S........... 44
31. Achatina panthera Fér. Fér., Hist............... 41

PLATE 39.

32. Achatina panthera lamarckiana Pfr. Specimen.... 42
33. Achatina leucostyla Pils. Specimen............... 45
34, 35. Achatina capelloi Furt. J. de Conch........... 28

PLATE 40.

1, 1. Petitia nitida Marts. (= grandidieriana). Conch. Mittheil...................................... 76
2, 3. Achatina leucostyla Pils. Specimens............. 45
4. Achatina studleyi Melv. & Pons. Proc. Mal. Soc..... 14

PLATE 41.

5, 6. Achatina panthera chrysoderma Pils. Specimens.. 46
7. Cochlitoma machachensis Smith. Proc. Mal. Soc. 84
8. Achatina pintoi Bgt. Afr. Equat.................. 63

FIGURE		PAGE
	PLATE 42.	
6, 7.	Leptocala grandidieriana Bgt. Afr. Equat.	75
8.	Achatina panthera (mossambica), epiphragm. After Brancsik.	2
9.	Achatina panthera neumanni Marts. D. Ost-Afr.	45
10.	Achatina iostoma (?). After Buchholz.	32
	PLATE 43.	
1, 2.	Achatina immaculata Lam. Specimens.	50
3, 4.	Callistoplepa pellucida Putz. Soc. Malac. Belg.	128
	PLATE 44.	
1.	Archachatina papyracea Pfr. C. Icon.	117
2.	Achatina maculata Dh. Fér., Hist.	48
3.	Ceras dautzenbergi Dup. et Putz. Soc. Malac. Belg.	155
4, 5.	Ceras manyemaense Dup. et Putz. Soc. Malac. Belg.	155
6.	Columna columna Müll., egg. After Rang.	121
7.	Columna columna Müll. After Rang.	121
	PLATE 45.	
1, 2.	Achatina occidentalis Pils. Specimen.	23
3.	Achatina rodatzi Dkr. Novit. Conch.	60
	PLATE 46.	
4.	Archachatina bicarinata Brug. Specimen.	107
5-9.	Columna columna Müll. Specimen.	121
10, 11.	Columna hainesi Pfr. Specimen.	124
12.	Columna leai Tryon. Specimen.	123
13.	Columna leai Tryon. Am. Journ. Conch.	123
	PLATE 47.	
14-17.	Callistoplepa barriana Sowb. After d'Ailly.	127
18-20.	Callistoplepa shuttleworthi Pfr. After d'Ailly.	127
21, 22.	Callistoplepa marteli Dautz. After Dautzenberg.	129
23.	Callistoplepa fratercula D. & P. Soc. Mal. Belg.	129
	PLATE 48.	
24, 25.	Clavator clavator Petit. Mag. Zool.	200
26.	Clavator placostyloides Kob. Specimen.	195
27, 28.	Clavator vayssieri Anc. Journ. de Conch.	195

FIGURE PAGE

PLATE 49.

29. Clavator grandidieri C. & F. Journ. de Conch..... 194
30. Clavator obtusatus Gmel. Moll. Madag............ 196
31. Clavator obtusatus Gmel. Specimen.............. 196
32, 33. Clavator moreleti Desh. Specimen............. 198
34. Clavator moreleti Desh. Fér., Hist............... 198
35. Clavator subobtusatus C. & F. J. de Conch........ 197
36. Clavator moreleti Dh. Moll. Madag............... 198

PLATE 50.

37. Clavator johnsoni Smith. P. Z. S................ 200
38. Clavator watersi Ang. P. Z. S................... 197
39. Clavator eximius balstoni Ang. Specimen......... 203
40, 41. Clavator eximius crossei Kob. Moll. Madag..... 204

PLATE 51.

42, 43. Clavator heimburgi Kob. Conch. Cab.......... 201
44. Clavator eximius balstoni Ang. P. Z. S............ 203
45, 46. Clavator eximius Shuttl. Notitiæ.............. 202

PLATE 52.

46-49. Chilonopsis nonpareil Perry. P. Z. S........... 174
50, 51. Chilonopsis nonpareil darvinianus Fbs. P. Z. S. 177
52. Chilonopsis terebellum Sowb. Journ. Geol. Soc..... 179
53. Chilonopsis melanioides Woll. Specimen.......... 177
54. Chilonopsis subtruncatus Smith. P. Z. S.......... 180
55, 56. Chilonopsis subplicatus Sowb. Specimen....... 178
57. Chilonopsis exulatus Bens. Specimen............. 180
58. Chilonopsis exulatus Bens. P. Z. S............... 180
59. Chilonopsis turtoni Smith. P. Z. S............... 181
60. Chilonopsis turtoni Smith. Specimen............. 181

PLATE 53.

60. Rumina decollata maura (=paviæ). J. de Conch.. 214
61. Rumina decollata maura (=paviæ). Rossm., Iconogr. 214
62. Rumina decollata claviformis Kob. Rossm., Iconogr. 214
63. Rumina decollata var. Rossm., Iconogr............ 214
64. Rumina decollata ventricosa Bgt. Rossm., Iconogr.. 214
65, 66. Rumina decollata maxima Bgt. Rossm., Iconogr. 214
67. Rumina decollata var. Rossm., Iconogr........... 214
68. Rumina decollata ventricosa Bgt. Mal. Alg........ 214

FIGURE PAGE
69. Rumina decollata lanceolata Bgt. Mal. Alg........ 214
70. Rumina decollata L. Moll. France................ 212
71. Rumina decollata flammulata Bgt. Rossm., Iconogr. 214
72. Rumina decollata flammulata Bgt. Mal. Alg....... 214

PLATE 54.

73-79. Riebeckia sokotorana Marts. Conch. Mittheil.... 205
80. Riebeckia gollonsirensis G.-A. Socotra Exped...... 206
81. Riebeckia gollonsirensis G.-A. P. Z. S............. 206
82. Riebeckia decipiens Sm. Conch. Mittheil.......... 206
83. Riebeckia decipiens Sm. Socotra Exped........... 206
84. Riebeckia insculpta Sm. Socotra Exped........... 208

PLATE 55.

85, 86. Riebeckia adonensis G.-A. P. Z. S............. 207
87, 88. Riebeckia adonensis G.-A. Conch. Mittheil...... 207
89, 90. Riebeckia arguta Martens. Conch. Mittheil..... 209
91, 92. Riebeckia hirsuta G.-A. (=arguta). P. Z. S. .. 210
93. Riebeckia jessica G.-A. (=arguta). P. Z. S. 210
94, 95. Trichodina barbigera Morel. Sér. Conch. 182
96. Trichodina marmorea Rve. C. Icon............... 182
97. Riebeckia enodis G.-A. P. Z. S.................... 208
98. Riebeckia enodis G.-A. Socotra Exped. 208
99. Rumina decollata L. After Dupuy............... 212
1, 2, 3. Rumina decollata gracilis Pfr. After Kobelt... 215

PLATE 56.

4. Trichodina monticola Morelet. Voy. Welwitsch...... 186
5-8. Trichodina monticola Morelet. After Girard...... 186
9, 10. Trichodina clavus Pfr. Specimens.............. 184
11. Trichodina clavus Pfr. After Reeve.............. 184
12. Trichodina paxillus Reeve. After Reeve.......... 186
13. Trichodina massoniana Crosse. J. de Conch....... 184
14, 15. Trichodina massoniana Crosse. Specimen...... 184
16, 17. Trichodina aratispira Pils. Specimen.......... 185
18, 19. Trichodina lotophaga Morel. Fér., Hist........ 191
20. Trichodina lotophaga Morel. Sér. Conch.......... 191

PLATE 57.

21, 22. Trichodina cornea Morel. J. de Conch. 189
23. Trichodina cornea Morel. Specimen............... 189
24. Trichodina monacha Morel. J. de Conch.......... 188

FIGURE PAGE
25, 26. Trichodina olivacea Pils. Specimens........... 189
27. Trichodina pallens Pfr. (= simpularia). Novit. Conch.................................. 190
28. Trichodina simpularia Morel. Sér. Conch......... 190
29, 30. Homorus cylindraceus Bgt. Afr. Equat........ 144
31. Homorus jouberti Bgt. Afr. Equat................ 144
32, 33. Homorus oleatus Marts. After Martens........ 146
34. Homorus nigellus Morel. Voy. Welwitsch.......... 147
35, 36. Pseudoglessula humicola D. et P. After D. and P. 163
37. Homorus nebulosus Morel. J. de Conch........... 148
38, 39. Pseudoglessula diaphana D. et P. After D. and P. 164

Plate 58.

40, 41. Homorus cyanostoma Pfr. Conch. Cab......... 131
42. Homorus cyanostoma Pfr. Specimen.............. 131
43, 44. Homorus vernicosus Jick. After Jickeli........ 132
45, 46. Homorus variabilis Jick. After Jickeli......... 134
47. Homorus variabilis lhotellerii Bgt. After Jickeli... 135
48. Homorus variabilis jickelii Bgt. After Jickeli..... 135
49. Homorus perrierianus Bgt. Afr. Equat........... 137
50. Homorus antinorii Morelet. After Morelet........ 133
51. Homorus ragazzii Poll. Bull. Soc. Mal. Ital....... 132
52, 53. Homorus darnaudi Pfr. Novit. Conch.......... 133
54, 55. Homorus angustatus Jick. After Jickeli....... 135
56, 57. Homorus suavolens Jick. After Jickeli........ 136
58, 59. Homorus subulatus Jick. After Jickeli......... 136

Plate 59.

60, 61, 62. Homorus opeas Pils. Specimen............. 151
63, 64. Homorus decollatus Morel. J. de Conch........ 153
65, 66, 67, 68. Homorus pattalus Pils. Specimens....... 147
69. Homorus bacilliformis Jonas. Abbild.............. 152
70, 71. Homorus involutus Gld. Specimen............ 150
72, 73. Homorus sowerbyanus Morel. Specimen........ 145
74. Homorus sowerbyanus Morel. J. de Conch......... 145

Plate 60.

75. Homorus badius Marts. Conch. Mittheil........... 149
76, 77. Homorus lugubris Morel. J. de Conch.......... 154
78. Homorus martensi D. et P. After Dup. et Putz.... 148
79. Homorus lentus Smith. P. Z. S................... 143
80. Homorus lentus Smith. Afr. Equat................ 143
81. Homorus usagaricus Sm. Am. Mag................ 142

FIGURE PAGE
82. Homorus mamboiensis circumstriatus Mart. D. Ost-Afr. 140
83. Homorus mamboiensis Smith. Ann. and Mag. 140
84. Homorus lagariensis Smith. Proc. Malac. Soc. 141
85, 86. Homorus castaneus Marts. D. Ost-Afr. 139
87. Homorus silvicola Marts. D. Ost-Afr. 141
88. Homorus solidiusculus Sm. P. Z. S. 142

PLATE 61.

89. Pseudoglessula leroyi Bgt. Afr. Equat. 168
90, 91. Pseudoglessula kirki Crav. P. Z. S. 166
92. Pseudoglessula gracilior Smith. Specimen. 167
93. Pseudoglessula prestoni Smith. Specimen. 167
94. Pseudoglessula introversa Smith. Ann. and Mag. . . 169
95. Pseudoglessula subcarinifera Smith. Ann. and Mag. 169
96, 97. Pseudoglessula heteracra Bttg. Conch. Cab. 165
98. Pseudoglessula fuscidula Morel. Voy. Welwitsch. . . 160
99. Pseudoglessula conradti Marts. D. Ost-Afr. 170
2, 3. Pseudoglessula duseni d'Ailly. After d'Ailly. 159
4, 5. Pseudoglessula retifera Martens. After Martens. . 164
6, 7. Pseudoglessula sjostedti d'Ailly. After d'Ailly. . . 165
8, 9. Pseudoglessula abetifiana Rolle. Conch. Cab. 162
10. Pseudoglessula clavata Gray. Conch. Icon. 157
11. Pseudoglessula clavata Gray. Monatsber. 157
12. Pseudoglessula clavata Gray. After d'Ailly. 157
13. Pseudoglessula strigosa Morel. Voy. Welwitsch. . . . 161
14. Pseudoglessula muscorum Morel. Voy. Welwitsch. . 161

PLATE 62.

15, 16, 17. Homorus cyanostoma Pfr. After Jickeli 130
18. Pseudoglessula leroyi Bgt. After Martens. 156
19. Trichodina (Bocageia) lotophaga Mor. After Girard. 191
20, 21. Chilonopsis melanioides Woll. After Pilsbry. . . . 171
22, 23, 24. Achatina panthera Fér. After Wiegmann. . . xii
25, 27. Chilonopsis sulcata F. de W. Bull. Moscou. 177
26. Pseudoglessula (?) humicola Dup. After Dupuis, 157, 163

PLATE 63.

29. Archachatina bicarinata Brug. After Férussac. . . . xiv
30, 32. Achatina panthera Fér. After Wiegmann. xii
31. Pseudoglessula phæa Putz. After Putzeys. 162

FIGURE PAGE

Plate 64.

64. Achatina chrysoleuca Pils. Winchester, del........ xii
65, 66. Achatina leucostyla Pils. Pilsbry, del. xii
67. Achatina zebra Brug., embryo. After Semper..... xiii
68. Achatina chrysoleuca Pils. Pilsbry, del. xii
69, 70, 71. Cochlitoma crawfordi Morel. Pilsbry, del.... xiii

Plate 65.

41, 42. Limicolaria vanattai Pils. Winchester, del...... xi
43. Rumina decollata L., pharynx and salivary glands, from below. Pilsbry, del...................... 211
44-46. Rumina decollata L. Pilsbry, del............. 211

Dates of Issue of the Parts of Vol. XVII.

Part 65, pp. 1-64, plates 1 to 10, Sept. 23, 1904.
Part 66, pp. 65-112, plates 11 to 23, Nov. 26, 1904.
Part 67, pp. 113-208, plates 24 to 43, March 1, 1905.
Part 68, pp. 209-232, plates 44 to 65, June, 1905.
Title-page, Contents and Introduction, June, 1905.

MANUAL OF CONCHOLOGY.

Family ACHATINIDÆ.

Holopod, sigmurethrous snails with the central tooth of the radula very narrow (with few exceptions), its cusp small or absent, the side teeth tricuspid or bicuspid. Jaw generally striated. Genitalia with no accessory organs. Kidney two or three times the length of the pericardium. Pulmonary vein without large branches. Shell ovate, turrited or cylindric, well developed and capable of containing the entire soft parts; the columella frequently truncated below.

Distribution, tropical and subtropical regions throughout the world.

These snails differ from *Bulimulidæ* by the long kidney, from *Acavidæ* by the very diverse venation of the lung and the different dentition, and from the multiform group *Helicidæ* chiefly by the narrow central tooth of the radula and the structure of the shell. Up to this time no Heliciform or slug-like *Achatinidæ* have been made known, but such types probably exist in so large and varied a family.

While widely distributed in the tropics, most of the genera are confined to Africa and middle America. In tropical Africa the number and variety of species is very great, and they occupy that region almost to the exclusion of other groups of Holopod snails, excepting the carnivorous *Streptaxidæ*. The African *Achatinidæ* fall into three groups which may be rated as subfamilies, although the absence of full anatomical data at the present time renders any classification provisional.

I. Subfamily Achatininæ. Mostly capacious shells, ovate or rarely subcylindric, usually decorated with zigzag stripes; whorls without internal lamellæ and coiled around a slender axis, which is solid or nearly so. African. (See below.)

II. Subfamily Stenogyrinæ. Shell turrited or cylindric, unicolored or having darker streaks, rarely if ever zigzag-striped. No internal lamellæ; axis slender, solid or nearly so. Tropical in both hemispheres (see p. xvi).

III. Subfamily Coeliaxinæ. Stenogyroid forms with internal lamellæ, the axis usually tubular. West and South Africa, and Parisian Eocene (see vol. xviii).

Subfamily Achatininæ.

This group comprises about a dozen genera, which may be arranged as follows, the general sequence being from the more advanced to the less specialized groups, allied forms being bracketed together.

Pseudachatina.

Columna.
Archachatina.

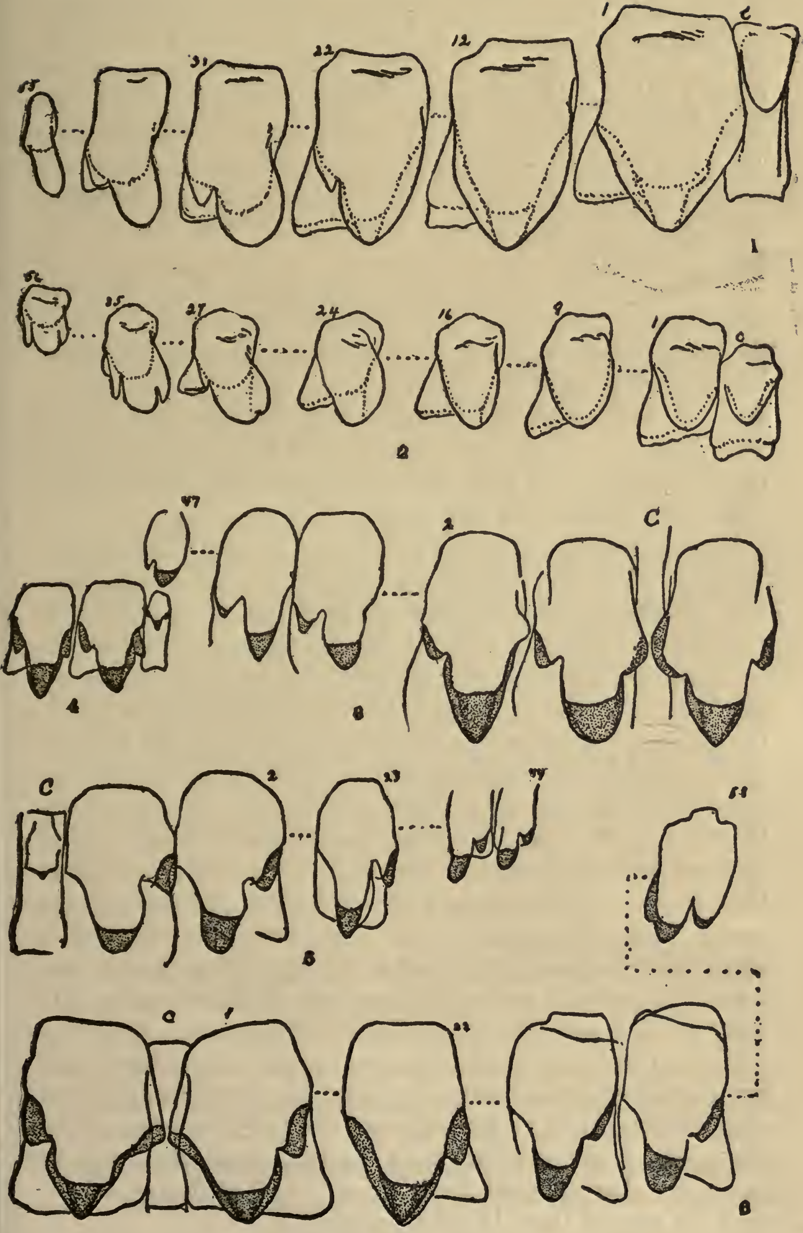
Metachatina.
Cochlitoma.

Achatina
Burtoa

Limicolaria.
Atopocochlis.
Pseudotrochus.
Periderìopsis.

? Callistoplepa.

The soft anatomy of the groups is noticed below. All the forms examined conform closely to a common type, with three exceptions. In *Limicolaria vanattai* and *Cochlitoma crawfordi* I found the penis to have a true retractor, inserted distally on the diaphragm, while in all other forms known there is a secondary retractor, a branch of the right ocular band, and belonging to the columellar system, this structure being regarded as characteristic of *Achatinidæ*. The other notable structural divergence is in the radula of *Callistoplepa*, which has the middle tooth as wide as the laterals, its cusp well developed. In all other known *Achatinidæ* it is much narrower, with the cusp reduced.


13
31
22
12
1
c
52
35
27
24
16
9
1
0
47
2
C
C
2
23
47
58
C
1
22

1

2

4

3

5

6

PSEUDACHATINA (vol. xvi, p. 205). Soft anatomy unknown.

ATOPOCOCHLIS (vol. xvi, p. 218) has been dissected by Furtado. The jaw (pl. 1, fig. 7, after Furtado) is thin, arcuate, densely plicatulate vertically. Radula with 100 rows of 54.34.20.1.20.34.54 teeth each. Centrals narrow, obsoletely tricuspid, the cusp not overhanging. Laterals with the mesocone large, broadly rounded, the small ectocone also rounded; marginals with the entocone weakly developed (pl. 1, f. 6, after Furtado).

Genitalia (pl. 1, figs. 8, 9, after Furtado). Penis with the usual basal ring-muscle (*g p.*) pierced by the vas deferens; the latter inserted at the apex, with the retractor muscle, which is a branch from the ocular retractor (fig. 9). The spermduct is free from the vagina, but unites with the uterus. The vagina is ovoid and muscular, the duct of the spermatheca being inserted very high. The albumen gland is small (specimen collected in December).

PSEUDOTROCHUS (vol. xvi, p. 219). The anatomy has been investigated in *P. alabaster* by Semper, and *P. auripigmentum* by Schako. In *P. alabaster* the foot and the eye-tentacles are long and narrow (pl. 1, fig. 2, after Rang). The foot has no lateral margination, and the sole is undivided. There are two body-lobes on the left side of the mantle, small and very far apart. The kidney is double the length of the pericardium, band-like. Genitalia (pl. 1, fig. 1, after Semper) simple, without accessory organs. The duct of the spermatheca is not very long, but is inserted very high on the uterus. The vas deferens inserts at the apex of the penis, but passes through a circular muscle encircling the lower part of the penis. The retractor muscle of the penis is apical, and so placed that it passes through the loop formed by the vas deferens. It is short and wide, and inserted on the columellar muscle. The jaw has fine striation. Radula (pl. 1, fig. 3) with 80 to 100 teeth in the transverse rows; middle tooth very small, with tridentate cusp; lateral teeth broad-cusped, with a small blunt cusp at the outer side. In *P. auripigmentum,* Shako found the jaw (pl. 1, fig. 4) and teeth (pl. 1, fig. 5) to be like those figured by Semper for *P. alabaster*, except that the central tooth is not tricuspid.

According to a drawing of *P. solimana* made from life by Dr. R. Buchholz, and reproduced by v. Martens, the upper tentacles are long, contracted near the eyes; the fore part of the foot, from shell to head, is double the length of the short hind part, which is vertically truncate at the end. Perhaps the posterior truncation may be due to voluntary amputation.

PERIDERIOPSIS (vol. xvi, p. 241) is unknown anatomically.

LIMICOLARIA (vol. xvi, p. 247). Semper has dissected *L. turbinata* Rve., and I have examined *L. vanattai* Pils. In the latter species the lung (pl. 65, fig. 41) is richly vascular, the pulmonary vein predominating as usual in *Achatinidæ*, without large branches. The kidney is fully double the length of the pericardium. Ureter enclosed. The genital system (pl. 65, fig. 42) resembles that of *Achatina*. The penis is thick and short, with terminal vas deferens and retractor. The sheath is thin, and envelops the whole penis and the base of the v. d. and retractor. The vagina is long. *The retractor muscle of the penis is inserted on the lung floor or diaphragm.*

Semper reports the ring muscle or sheath of the penis as very short in *L. turbinata*, which otherwise seems like *L. vanattai*. The jaw of *L. vanattai* has rather wide flat plaits, narrowly overlapping.

The radula (p. ix, fig. 5) of *L. vanattai* has 53,1,53 teeth. Centrals narrow, with a minute cusp. Laterals large, *bicuspid*, no entocone being developed. The marginal teeth are also bicuspid. Semper found the same type of teeth in *L. turbinata*.

The soft anatomy of *Limicolaria* is chiefly notable for the normal insertion of the retractor muscle of the penis.

BURTOA (vol. xvi, p. 298). Soft anatomy is unknown.

ACHATINA (vol. xvii, p. 1). The anatomy of *A. fulica* has been examined by Semper, of *A. panthera* by Wiegmann and others; I have dissected *A. chrysoleuca* and *A. leucostyla*.

Externally the visible soft parts of *Achatina* do not differ from those of ordinary *Helicidæ*. The foot in *A. leucostyla* is coarsely reticulated by narrow impressed lines, the large areolæ being subdivided into a fine net-work. In front of the mantle the surface is coarsely rugose, longitudinal furrows being conspicuous, especially on the sides, less so in the middle. There seems to be no distinct dorsal groove or grooves. The face is granulose. Small labial projections are at each side of the mouth. The top of the foot, in some specimens, is a little flattened behind by pressure of the shell, but there is no such specialized area as has been noticed in *Archachatina.* The mantle-edge bears small right and left lobes, and a small right body-lobe.

The lung (pl. 64, fig. 64, *A. chrysoleuca*) is short, densely veined on both the cardiac and intestinal sides. The pulmonary vein has no large branches. The kidney is oblong, double the length of the pericardium, and the gut ureter is closed throughout. In *A. panthera* Wiegmann found the kidney to be three times the length of the pericardium. The jaw of *A. panthera* (pl. 62, fig. 24) is closely and finely striate vertically. That of *A. chrysoleuca* is much more coarsely and irregularly so.

The radula has 77,1,77 teeth in *A. chrysoleuca* (p. ix, fig. 6). The central tooth has no cusp in any part of the radula. The laterals have large conic mesocones, well-developed ectocones and more or less obsolete vestiges of entocones. In the outer marginal teeth the inner cusp is bifid (entocone + mesocone). In *A. panthera* (pl. 62, figs. 22, 23) Wiegmann counted 88,1,88 teeth. The central showed a quite rudimentary denticle; but in young animals he found a small cusp with minute protuberances on each side, indicating a degenerate tricuspid tooth. The lateral and marginal teeth are not unlike those described for *chrysoleuca.*

The genital system of *A. panthera* has been figured by Wiegmann (pl. 63, figs. 30, 32). The penis is enclosed in a glossy sheath and is fusiform below. The vas deferens enters through the wall of the sheath and passes upward out of its upper orifice, making a free loop, to which the retractor muscle is attached (fig. 30, *Mr.*). The vagina is very long (38 mm.); the duct of the spermatheca quite short, 15 mm. long, the spermatheca somewhat shorter.

A. fulica, dissected by Semper, is similar to *A. panthera* in genitalia (Reisen, Landmoll., pl. 12, f. 17).

In *A. leucostyla* (pl. 64, figs. 65, 66) the loop of the vas deferens does not extend out of the penis sheath (fig. 66). The vagina is short, and the spermatheca (fig. 65, *sp.*) and its duct very long. It differs conspicuously from *panthera* in these characters.

In *A. chrysoleuca* (pl. 64, fig. 68) the penis is similar to that of *leucostyla*, but longer. The spermatheca duct is also long (concealed in the figure). The relations of the penis, vas deferens and retractor are otherwise the same as in *A. panthera*.

The retractor muscle of the penis, in all species examined, is a branch from the right ocular band.

The subgenus *Leptocala* (vol. xvii, p. 72) is unknown anatomically.

METACHATINA (vol. xvi, p. 307). Anatomy unknown.

COCHLITOMA (vol. xvii, p. 76). The type species, *C. zebra* has been dissected by Semper. There are two separated cervical lobes on the left margin of the mantle. Kidney band-shaped. Genitalia as in *Achatina*, the vas deferens penetrating a sheath, the spermatheca being short-stalked. It is viviparous. In the uterus were found about 60 undeveloped eggs with calcareous shells, the smallest 3 mm., the largest 6 mm. long; then 25 embryos, which had freed themselves of the egg shell (pl. 64, fig. 67). On the foot they had a large podocyst, in the younger ones enveloping the shell like a mantle.

Jaw of *C. zebra* with a few broad welts, separated by very wide furrows, even-edged. That of *A. granulata* is described by Semper as coarsely ribbed. Teeth as in typical *Achatina*, in *C. zebra* 126 to 130 in a transverse row. In *A. granulata* there are 116 to 128 teeth.

In *C. granulata*, examined by Semper, the kidney was found to be double the length of the pericardium, band-shaped. The penis is of normal *Achatina* structure, its retractor muscle a branch of the right ocular band.

In *C. crawfordi* (Morel.), which I have dissected (pl. 64, figs. 69, 70, 71), the penis is a large, thin-walled sack with terminal retractor (fig. 71). The vas deferens enters at its lower third and continues upward inside as a fleshy pilaster (fig. 70). The whole penis is enveloped in a thin sheath. The vas deferens is free from the vagina. The duct of the spermatheca is rather long. The penis retractor is short, and *attached distally to the diaphragm* near its right border.

The kidney is of the usual oblong shape, more than double the length of the pericardium.

The jaw is irregularly and very strongly striated vertically. The radula has 54,1,54 teeth in the widest part (p. ix, fig. 3). Middle tooth subobsolete, without cusp, and with ill-defined basal-plate. Inner pair of laterals with boss-like entocones, which however have not well developed cutting points. The ectocones are well developed on all of the teeth, and even on the marginals the mesocone is simple, not emarginate as in *Achatina*.

This species differs notably from other species of *Achatina* and *Cochlitoma* by the insertion of its penis retractor muscle on the diaphragm.

ARCHACHATINA (this vol., p. 104). *A. marginata* has been dissected by Semper, who reports a single long cervical lobe on the left side of mantle. The flattening of the tail above has dentate borders. Genitalia as in *granulata*. Jaw with very numerous narrow riblets, not denticulating the cutting edge. Teeth 90 to 92 in a transverse row. Mesocone of the central fully half as long as the basal plate, even-edged and acute; first 5 laterals unicuspid; on the 6th a minute ectocone appears, increasing to the 14th, and then diminishing, together with the mesocone, which becomes blunter and wider. A. d'Ailly has figured the teeth of *A. marginata*, showing at least 12 unicuspid laterals (p. ix, fig. 1).

The anatomy of *A. bicarinata* has been figured by Deshayes in Férussac's Histoire. I reproduce a portion of his figure, pl. 63, fig. 29. The very large penis is partially enveloped by a sheath, which is penetrated by the vas deferens as usual. The distal insertion of the retractor is unknown. The duct of the spermatheca is long. The uterus contains three very large eggs. The well-developed cusp of the middle teeth and the unicuspid inner laterals are features unlike *Achatina*.

COLUMNA (this vol., p. 120). Soft anatomy unknown.

CALLISTOPLEPA (this vol., p. 125), has been examined by Adolf d'Ailly, who unfortunately did not dissect it further than to work out the dentition. The animal externally is streaked and maculate with black or brown. Foot long, slowly tapering towards the tail, with a triangular shell-flattening above, bounded by serrate ridges. The radula has *unicuspid central and lateral teeth*, the *centrals about as wide as the adjacent laterals.* The marginal teeth acquire a small ectocone, and the large cusp (mesocone + entocone) becomes bifid (p. ix, fig. 2, *C. barrianum.* The teeth of *C. shuttleworthi* are similar). The anatomy is otherwise unknown. This genus differs from all other *Achatininæ* by the wide middle teeth of the radula.

Key to genera of Achatininæ.

I. Embryonic whorls except the first sculptured, forming a large, semiglobose protoconch.
  - *a.* Embryonic whorls densely striated spirally; lip of the rather rudely sculptured shell expanded or reflexed. *Pseudachatina*, vol. xvi, p. 205.
  - *aa.* Embryonic whorls granose-decussate except the smoothish first one.
    - *b.* Protoconch bulbous or hemispherical; shell ovate; viviparous South African forms.
      - *c.* Columella abruptly truncate, Achatinoid. *Cochlitoma*, p. 76.
      - *cc.* Columella not truncate, blackish. *Metachatina*, vol. xvi, p. 307.
    - *bb.* Protoconch very large; shell ovate, of only 5-7 whorls; columella Achatinoid. West Africa. *Archachatina*, p. 104.
    - *bbb.* Shell cylindric or pillar-shaped, with Achatinoid coloration and columella. *Columna*, p. 120.

II. Embryonic whorls smoothish, without spiral sculpture or granulation.
  - *a.* Peristome well expanded or reflexed. *Atopocochlis*, xvi, p. 218.

aa. Peristome simple.
  b. Columella slightly truncated or obsoletely so; apex rather nipple-like; shape long-ovate. W. Africa.
    c. Axis imperforate. *Pseudotrochus*, xvi, p. 219.
    cc. Axis rimate or perforate. *Perideriopsis*, xvi, p. 241.
  bb. Columella not in the least truncated, continuous below.
    c. Oblong, with long spire, unicolored or with Achatinoid striping. *Limicolaria*, xvi, p. 247.
    cc. Ovate, with moderate or short spire; streaked, but without oblique or zigzag stripes. *Burtoa*, xvi, p. 298.
  bbb. Columella abruptly truncated at the base; shell ovate or rarely oblong; apex of the trochoidal type.
    c. Shell varying from moderately strong to very solid; middle tooth of the radula narrow. *Achatina*, p. 1.
    cc. Shell *very thin*, very closely and deeply striate, elaborately zigzag-striped; middle tooth of radula wide. *Callistoplepa*, p. 125.

Subfamily STENOGYRINÆ.

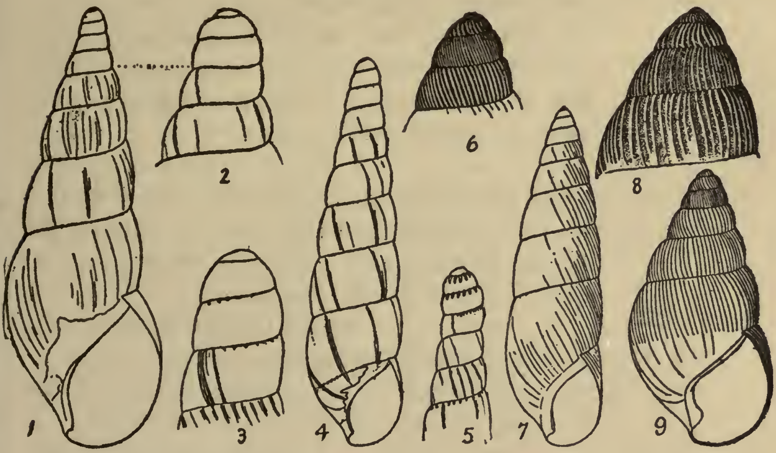
With the exception of *Rumina decollata*, little is known of the soft anatomy of African members of this series of genera. *Ceras, Trichodina* (*Petriola*) and *Clavator* are wholly unknown anatomically. Of the other genera the jaw and radula are more or less known. The jaw is much alike in all, and is of the ordinary Achatinoid type. The radulæ of all the genera have the narrow central teeth of the Achatinidæ, its cusp simple or with minute side-points. In the laterals there is more diversity:

(1) Lateral teeth bicuspid, without an entocone: genera *Pseudoglessula, Chilonopsis, Riebeckia.* The last has a tricuspid central, the other two have it unicuspid.

(2) Lateral teeth tricuspid; genera *Homorus, Bocageia, Rumina.* All have side cusps on the centrals.

All known details of the soft anatomy of these genera may be found in the text, under the several generic heads.

The apex of the shell is usually globose (figs. 1-5), as *Homorus, Rumina,* etc., in the Old World, and *Stenogyra* in America; but in some forms it is conic or trochoidal (figs. 7, 8), as in the African *Bocageia* and the South American *Neobeliscus.*



Figs. 1, 2, Homorus cyanostoma. 3, 4, H. pattalus. 5, H. opeas. 6, Pseudoglessula prestoni. 7, Bocageia (Petriola) clavus. 8, B. (P.) aratispira. 9, Pseudoglessula prestoni.

Key to genera of Stenogyrinæ contained in Vol. XVII.

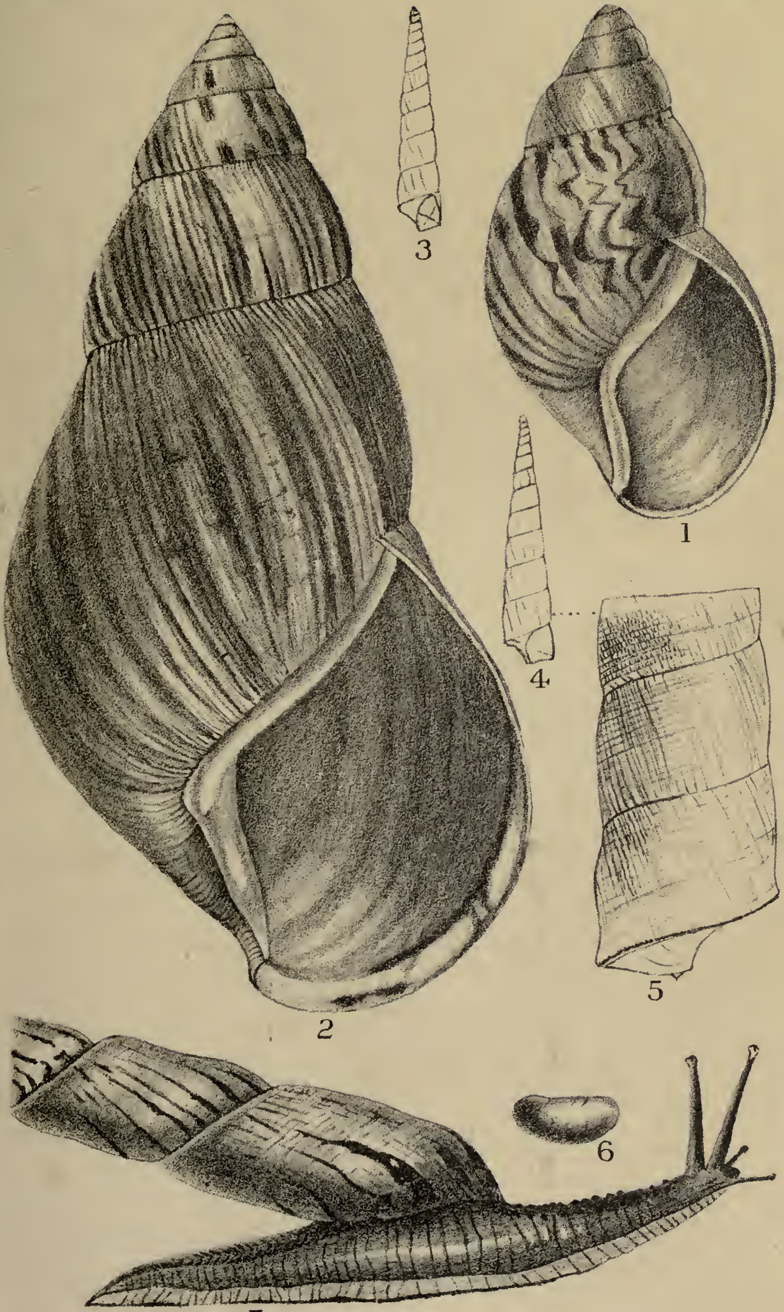
a. Apex of the trochoidal or conic type (figs. 7, 8).

Columella not truncate in fully adult shells, truncate in the young. Genus BOCAGEIA, p. 216.

Columella conspicuously truncate (figs. 7, 8). *Petriola,* p. 216.

aa. Apex of the globose type (figs. 1-5).

- *b.* Columella conspicuously and abruptly truncated below, Achatinoid; shell imperforate.
  - *c.* Apex involute at tip; whorls flattened, numerous (12), the last whorl acutely carinated. Genus CERAS, p. 155.
  - *cc.* Apex rounded; shell slender, the post-embryonic whorls smoothish (figs. 1-5). Genus HOMORUS, p. 130.
  - *ccc.* Apex rounded, vertically ribbed or reticulate; post-embryonic whorls rib-striate, the base smoother; shell ovate-pyramidal or turrited (figs. 6, 9). Genus PSEUDOGLESSULA, p. 156.
- *bb.* Columella obliquely truncated at base; spire entire.
  - *c.* Turrite, composed of 10-15 compactly-coiled whorls, pale, not variegated, vertically striate and rarely hirsute; lip simple; columella truncate or continuous. Sokotra. Genus RIEBECKIA, p. 204.
  - *cc.* Ovate or oblong, composed of 6½ to 9 whorls, smooth or roughly sculptured, variegated; lip simple or thickened; columella obliquely truncate at the base. St. Helena. Genus CHILONOPSIS, p. 171.
- *bbb.* Columella continuous below with the basal lip.
  - *c.* Adult shell cylindric, truncated by the loss of the early whorls, 4 to 7 whorls remaining. Genus RUMINA, p. 211.
  - *cc.* Adult shell entire; rimate or imperforate; large (50-150 mm. long), with 7 to 10 whorls, oblong or turrited, smoothish, covered with a yellow, brown-streaked cuticle. Madagascar. Genus CLAVATOR, p. 192.
  - *ccc.* Shell entire, turrited, of 10-15 compactly-coiled whorls; pale and smoothish, not variegated; lip simple; columella truncated or continuous. Socotra. Genus RIEBECKIA, p. 204.



2

3

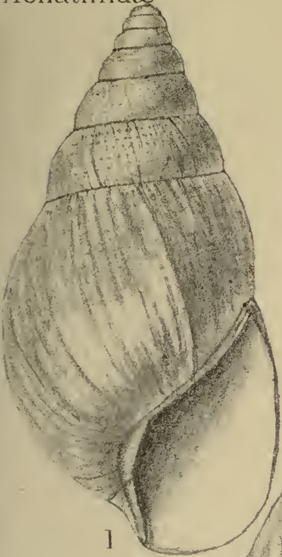
1

4

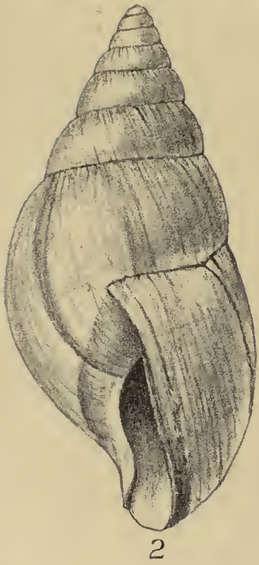
5

6

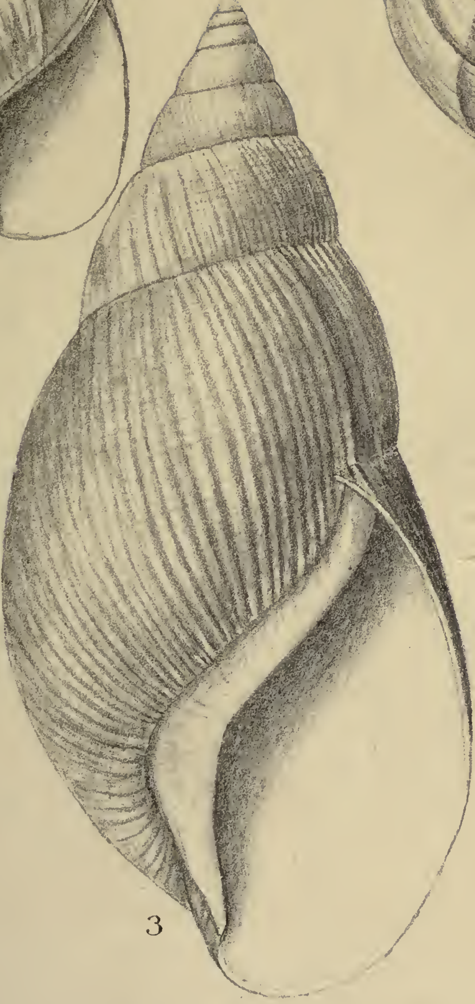
7



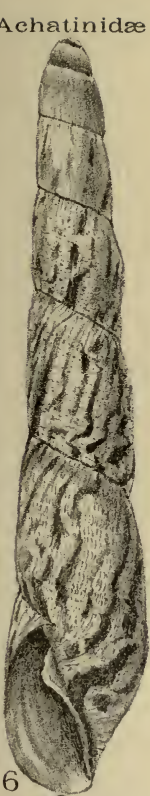
1



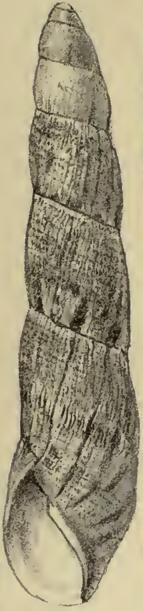
2



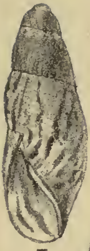
3



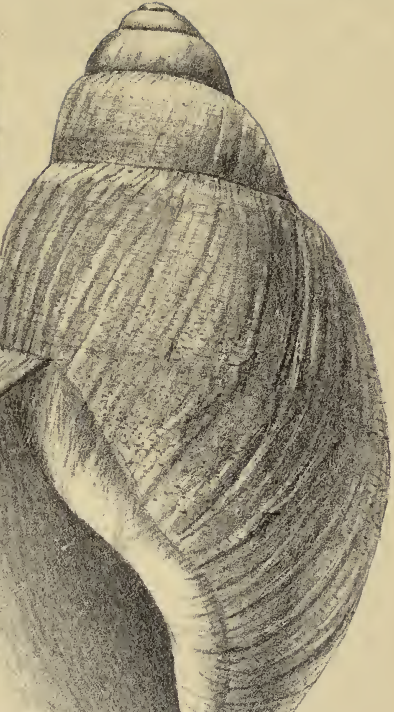
6



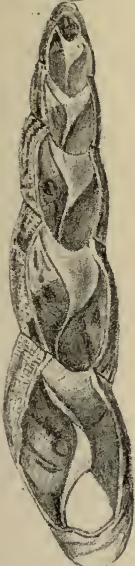
7



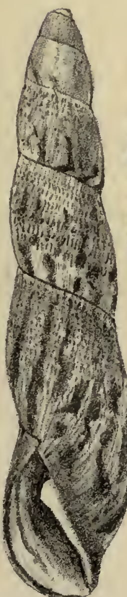
5



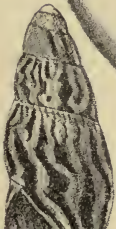
4



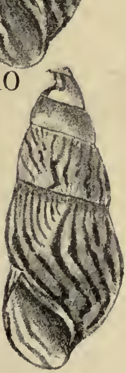
8



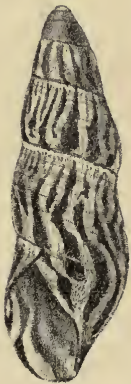
9



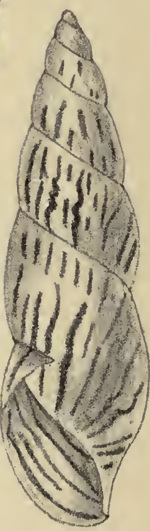
10



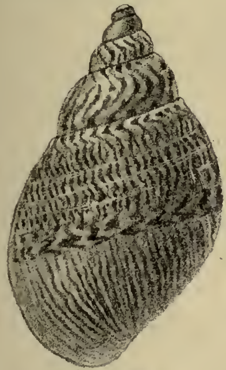
11



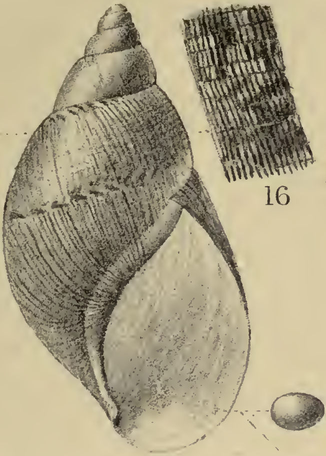
12



13

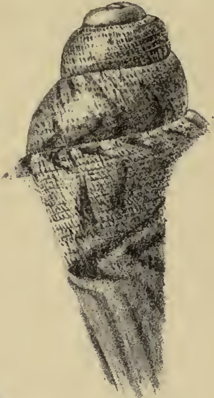


14

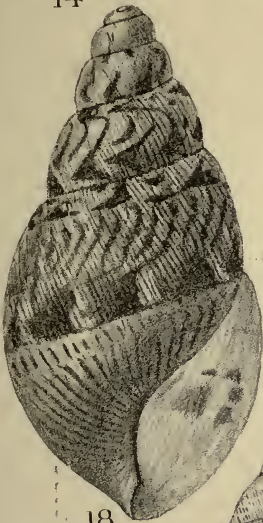


15

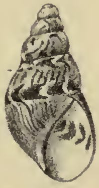
16



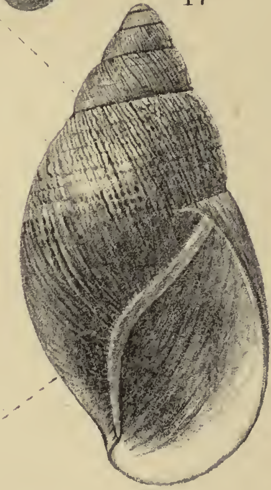
17



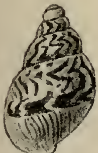
18



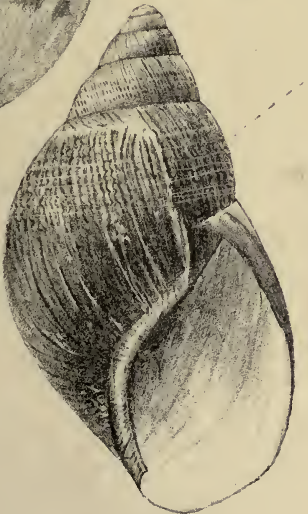
19



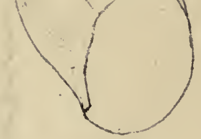
21



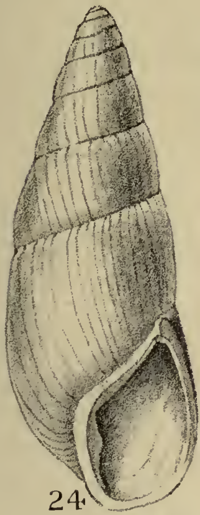
20



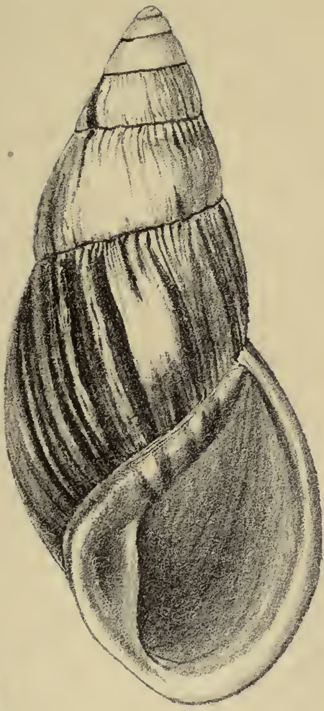
22



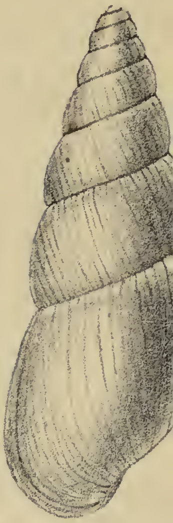
23



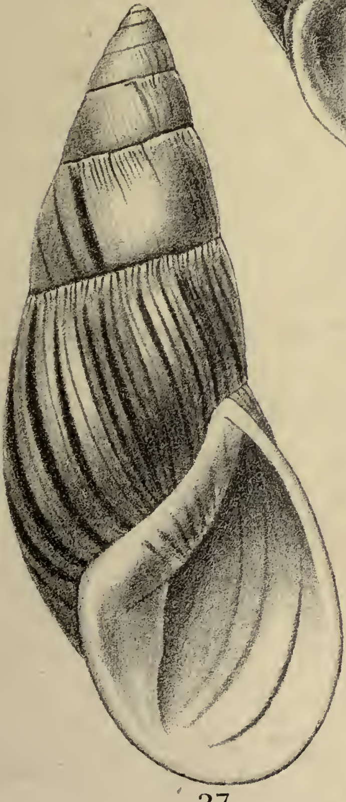
24



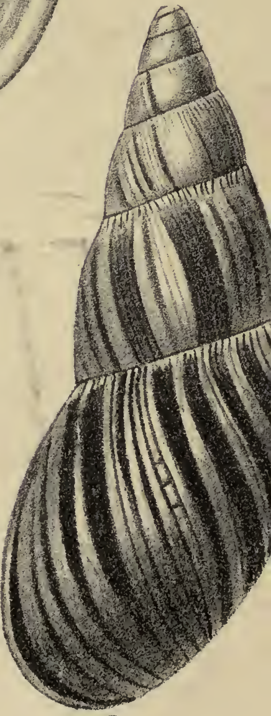
26



25



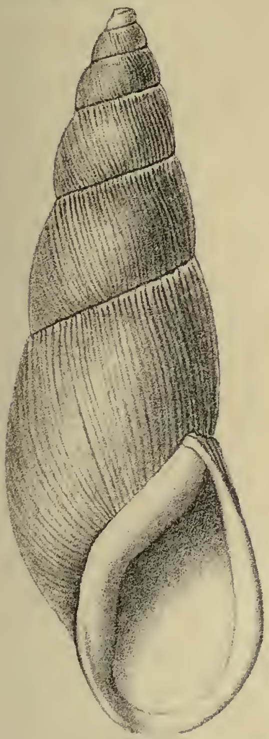
27



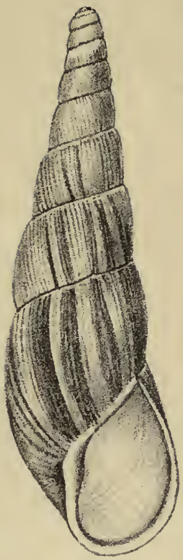
28

Achatinidæ

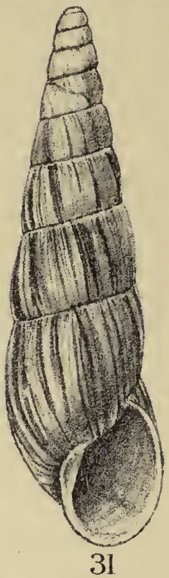
PLATE 49



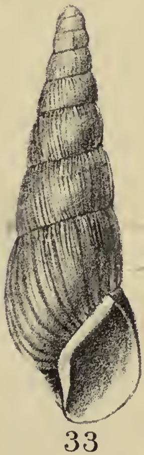
29



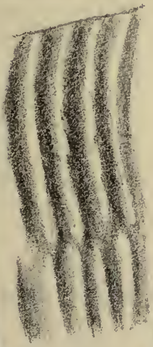
30



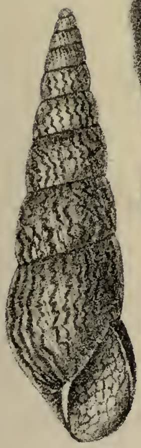
31



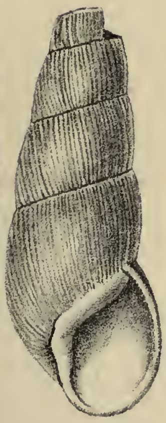
33



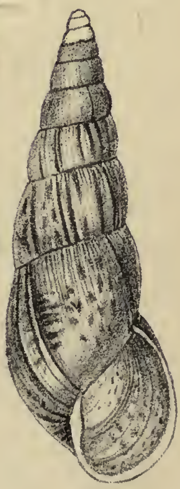
32



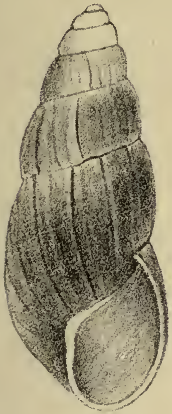
34

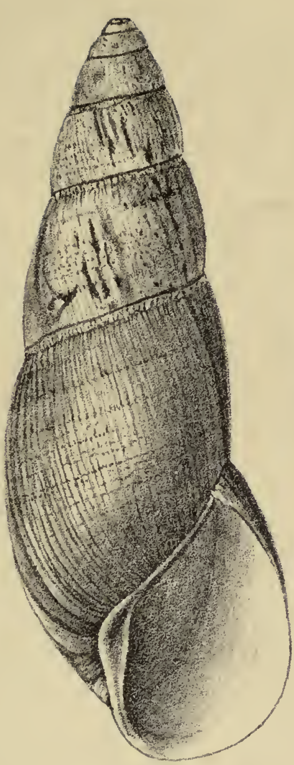


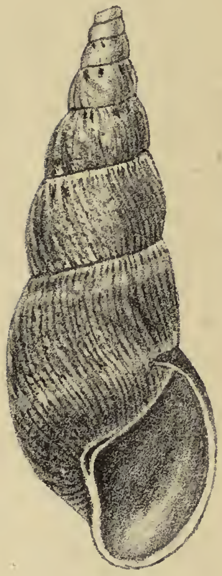
35

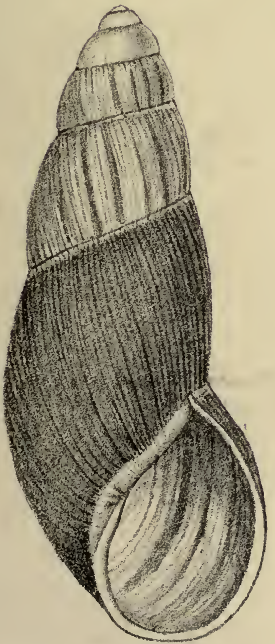


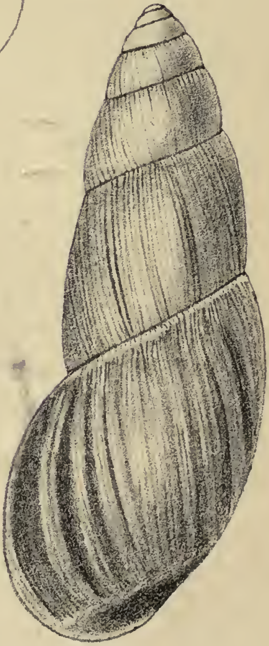
36

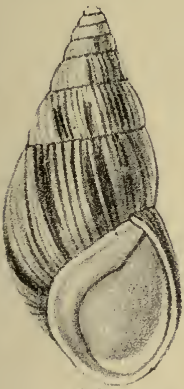

37


39

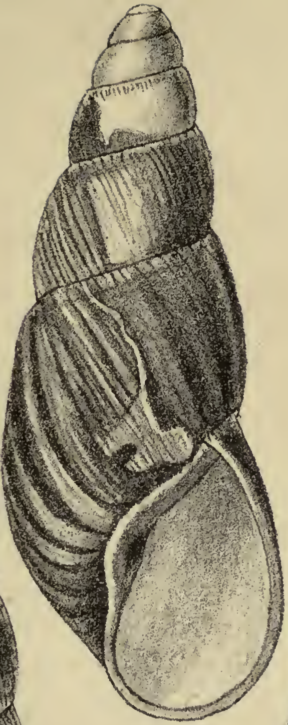

38


40

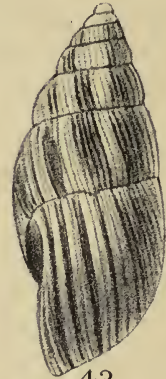

41



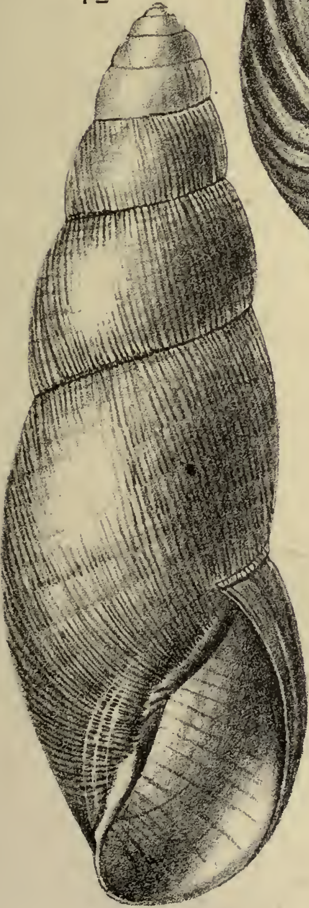
42



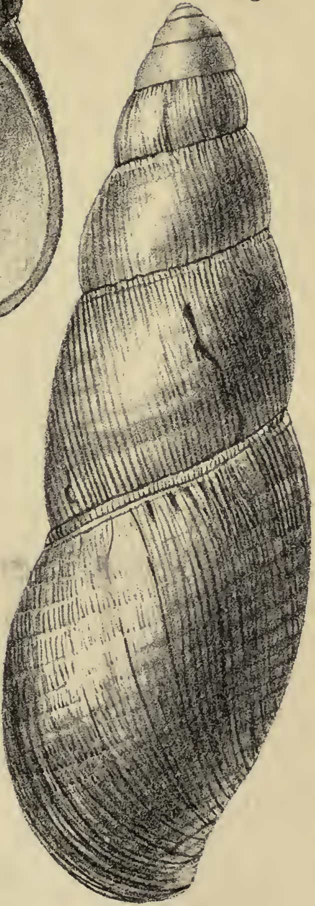
44



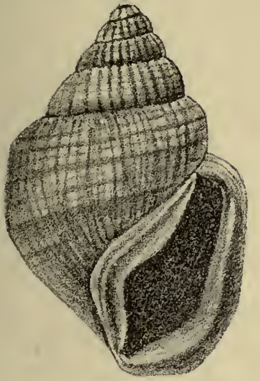
43

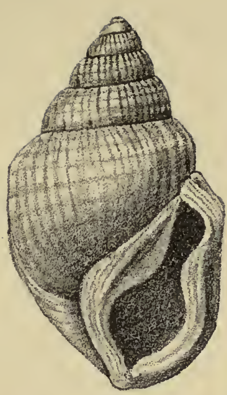


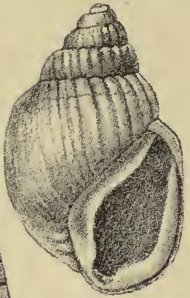
45

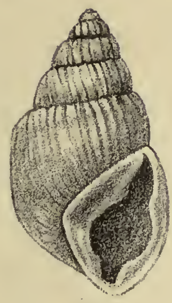


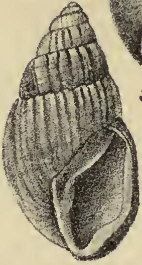
46

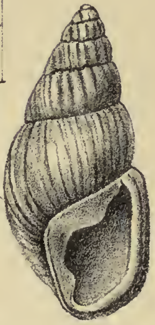

46

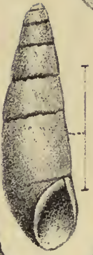

47

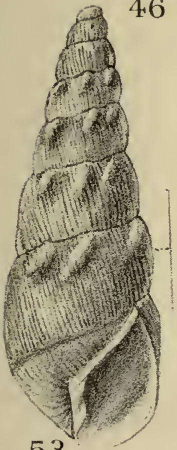

48

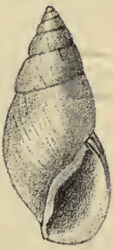

49

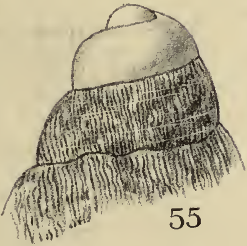

50

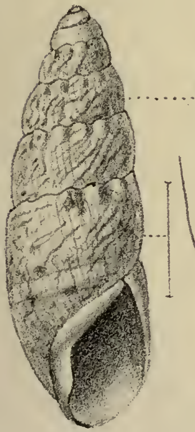

51

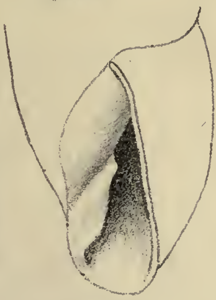

52

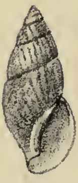

53

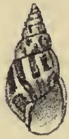

54

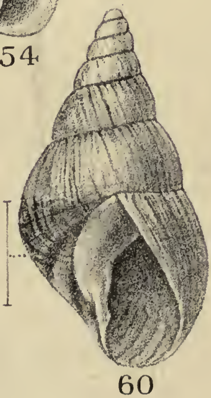

55

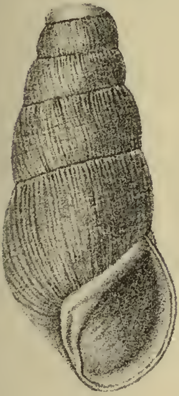

56

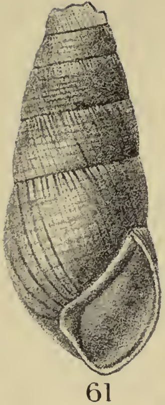

57

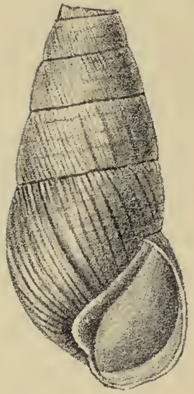

58

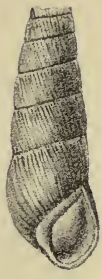

59

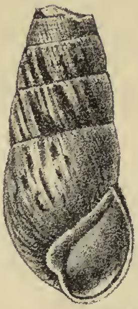

60

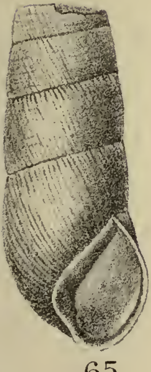

60

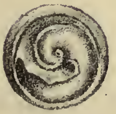

61

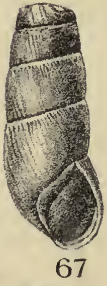

62

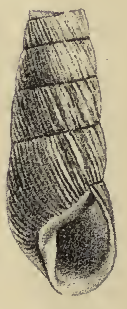

63

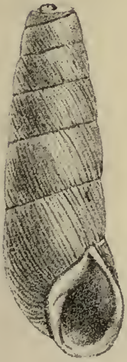

64

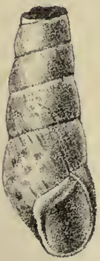

65

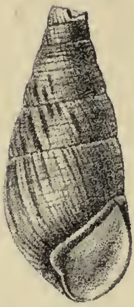

66

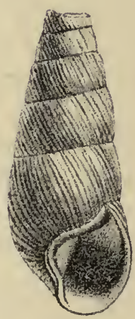

67

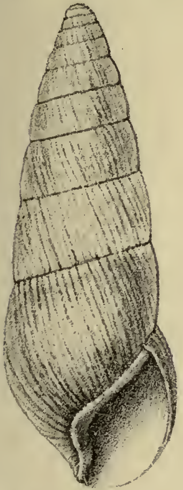

68

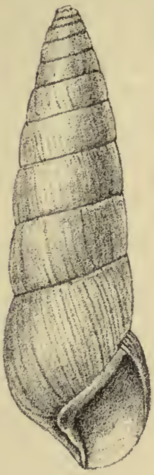

69

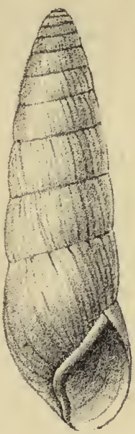

70

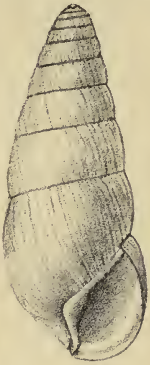

71

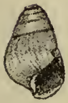

72

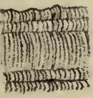

73

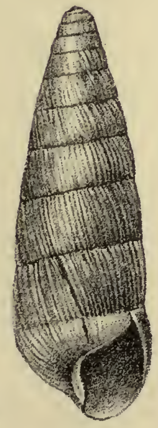

74

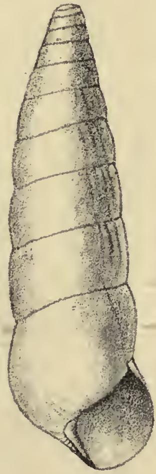

75

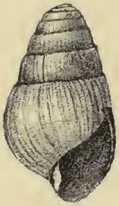

76

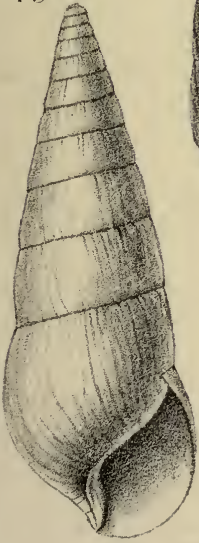

78

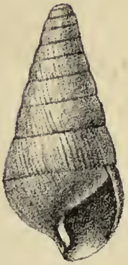

79

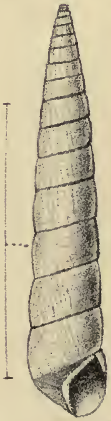

80

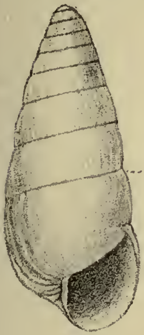

81

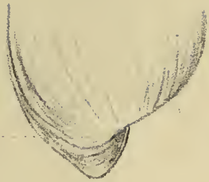

77

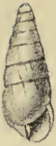

82

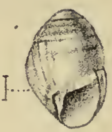

83

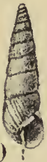

84

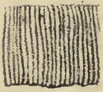

85

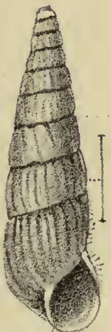

86

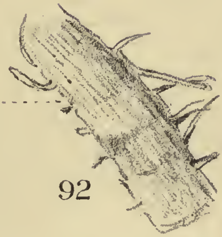

87

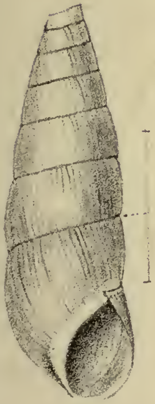

88

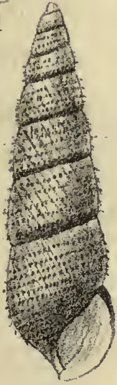

89

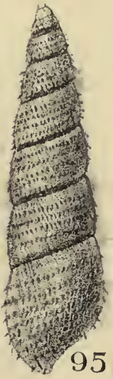

90

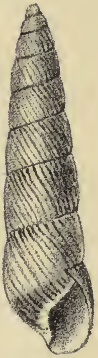

91

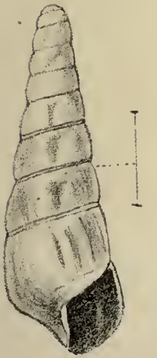

92

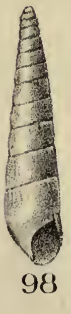

93

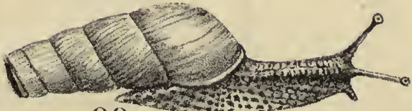

94

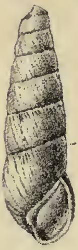

95

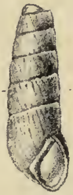

96

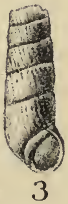

97

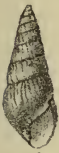

98

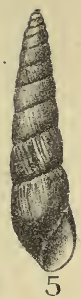

99

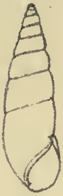

1

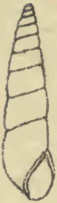

2

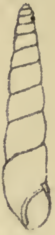

3

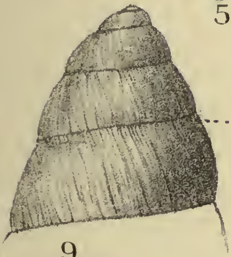

4

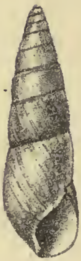

5

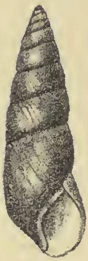

6

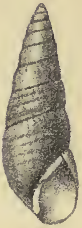

7

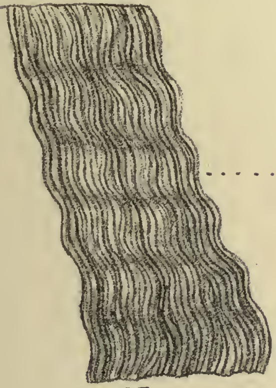

8

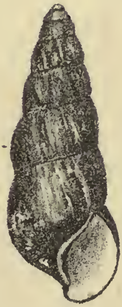

9

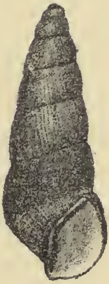

10

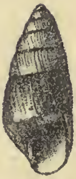

11

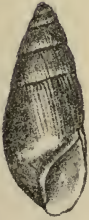

12

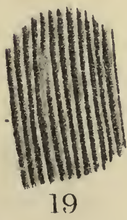

15

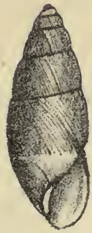

14

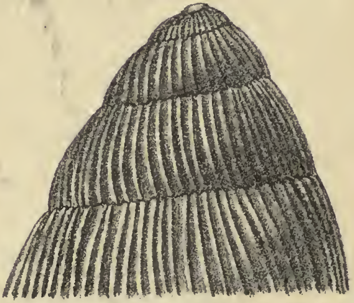

13

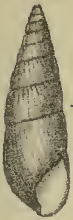

16


18

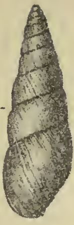

19


20

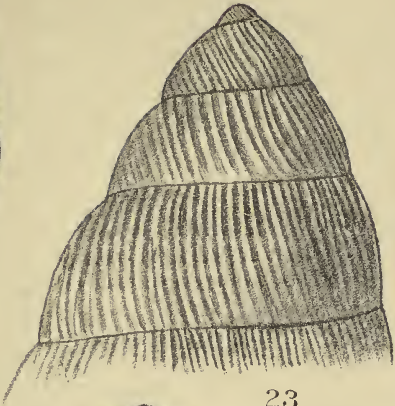

17



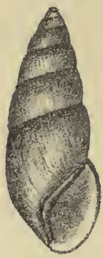
21



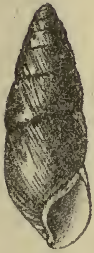
22



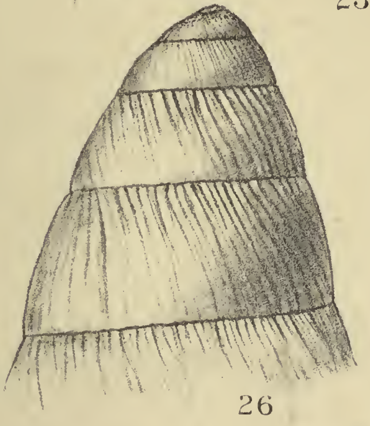
23



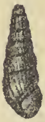
24



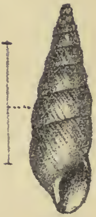
25



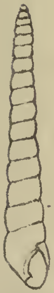
26



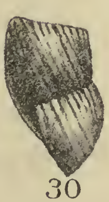
27



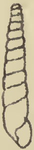
28



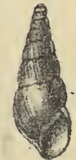
29



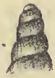
30



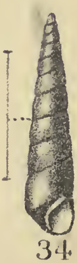
31



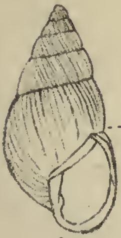
32



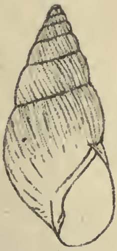
33



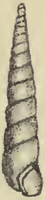
34



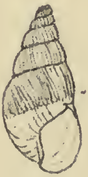
35



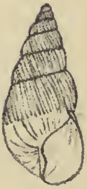
36



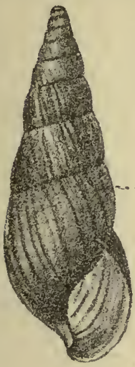
37

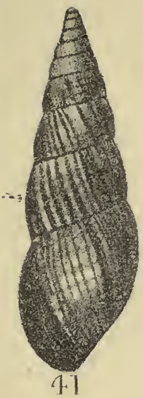


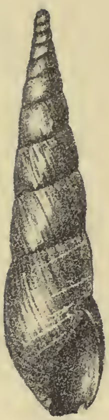
38

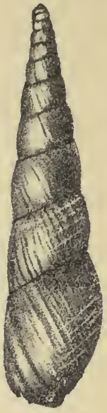


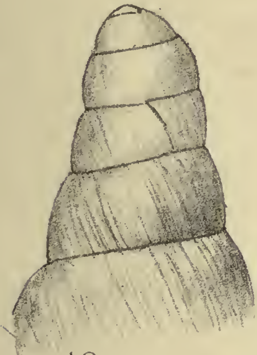
39

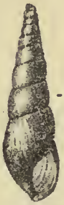

40

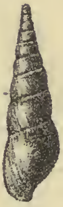

41

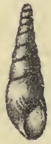

43

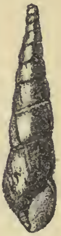

44

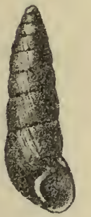

42

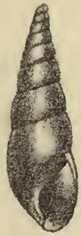

45

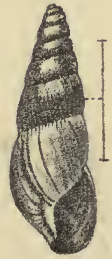

46

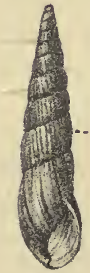

47

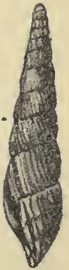

48

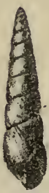

49

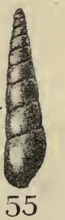

50

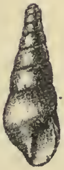

51

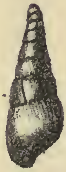

52

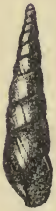

53

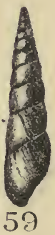

54

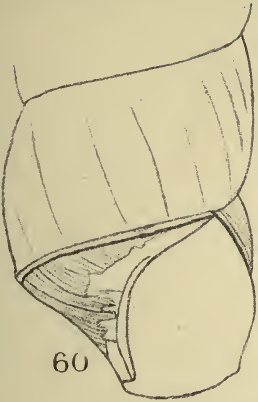

55

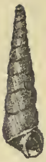

56

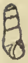

57


58

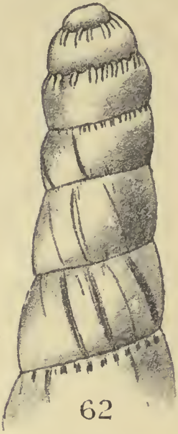

59

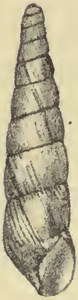

60

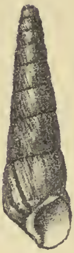

61

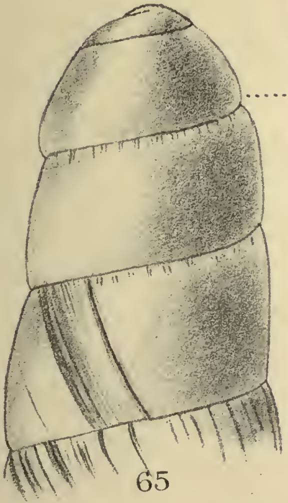

63

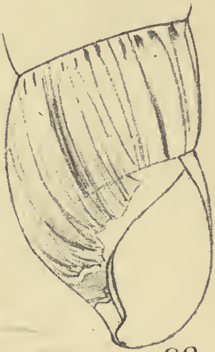
64

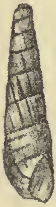

62

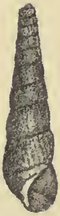

66

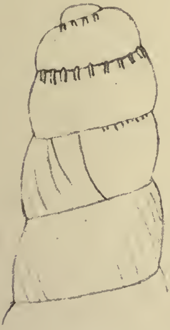

67

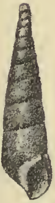

65

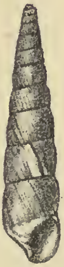

68

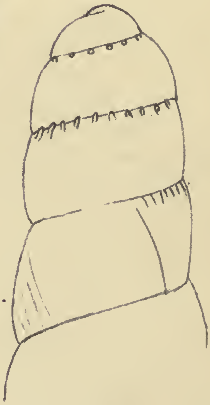

69

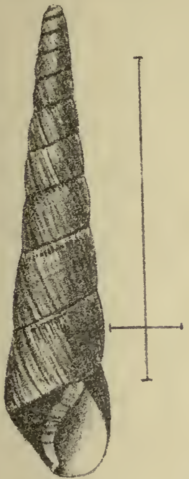

74


70

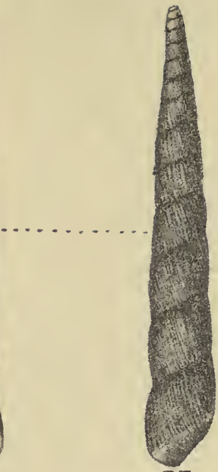

71

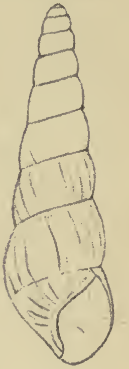

72

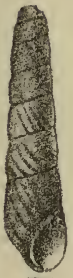

73

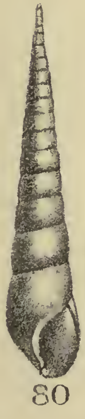

75

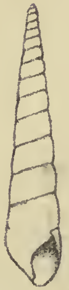
76

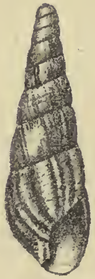

77

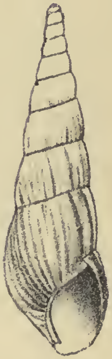

78

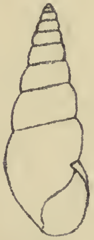

79

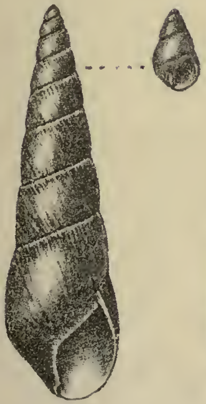

80

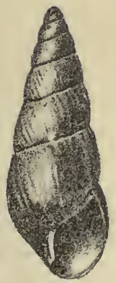

81

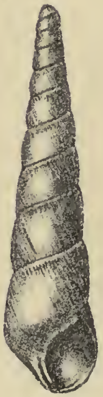

82

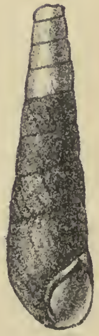

83

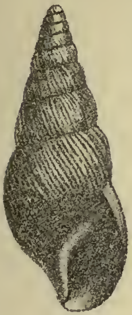

84

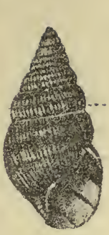

85

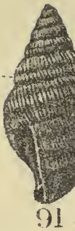

86

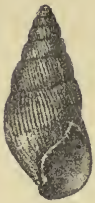

87

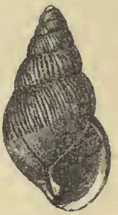

88

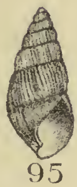

89

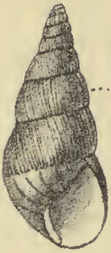

90

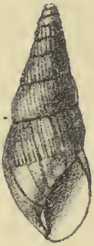

91

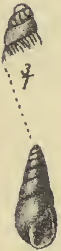

92

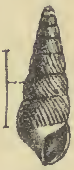

93

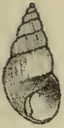

95

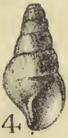

96

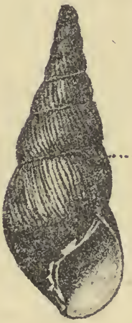

97

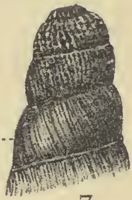

99

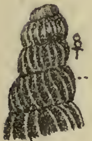

98

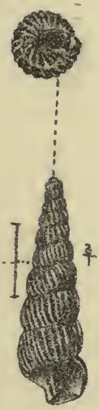

94

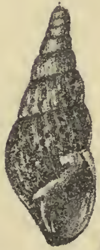

4

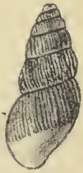

6

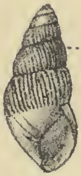

7

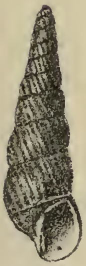

2

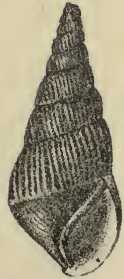

3

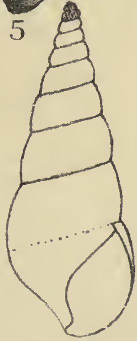

5

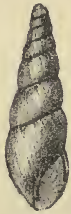

9

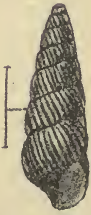

8

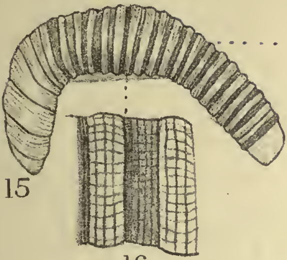

10

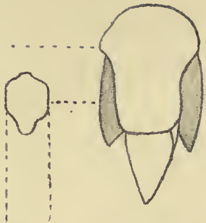

11

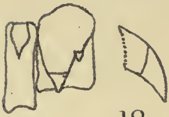

12

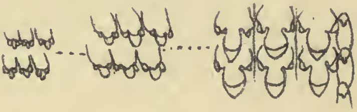

13

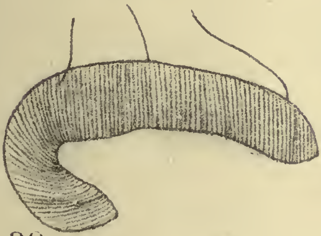

14

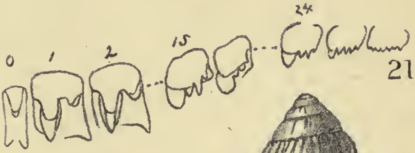

15
16

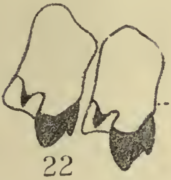

17

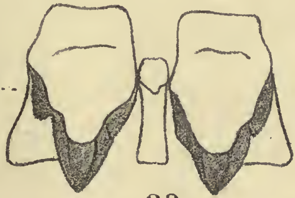

18

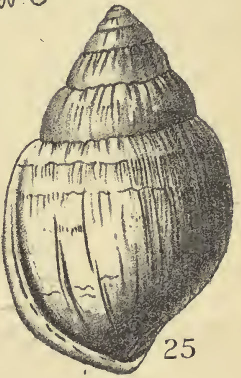

19

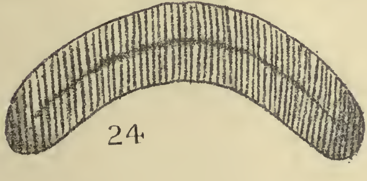

20

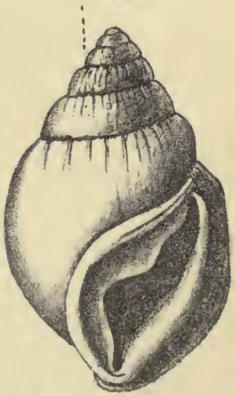

0
1
2
15
24
21

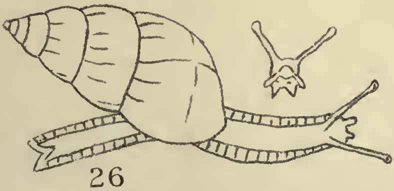

22

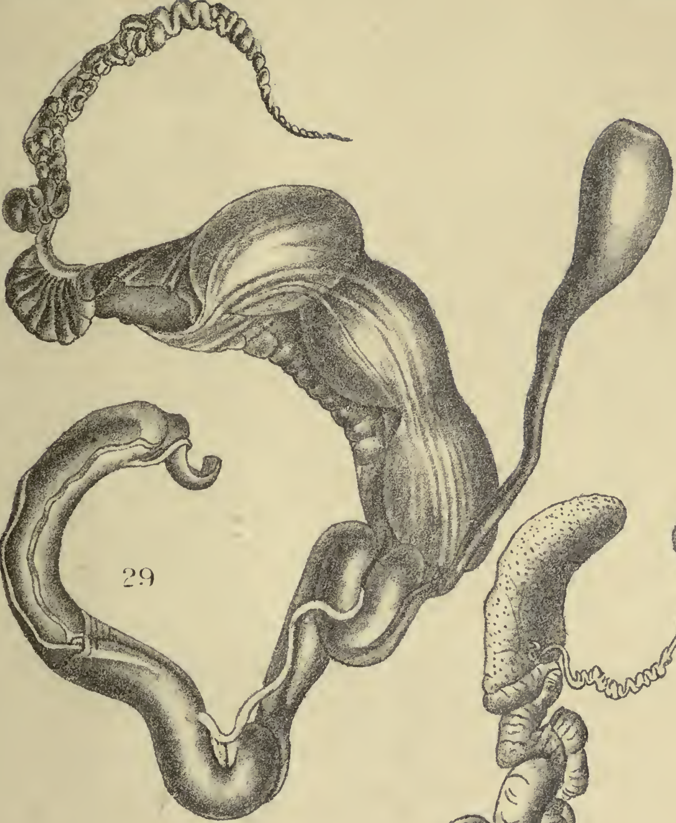

23

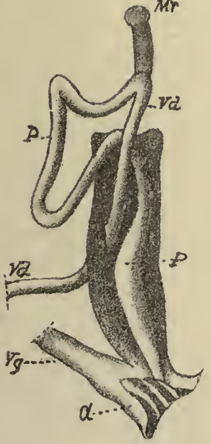

25

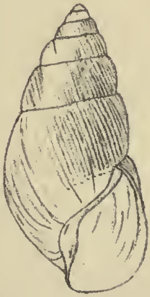

24

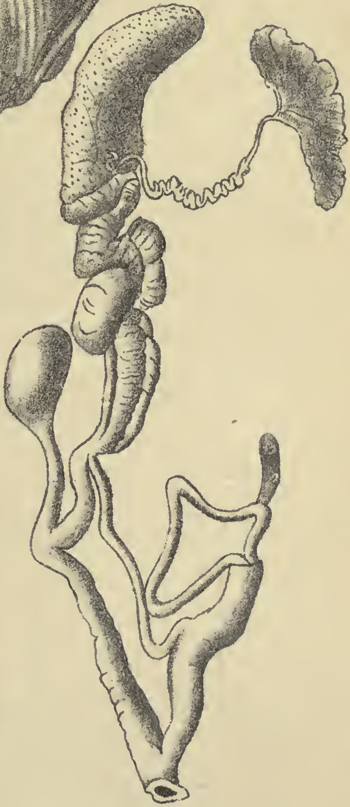

27

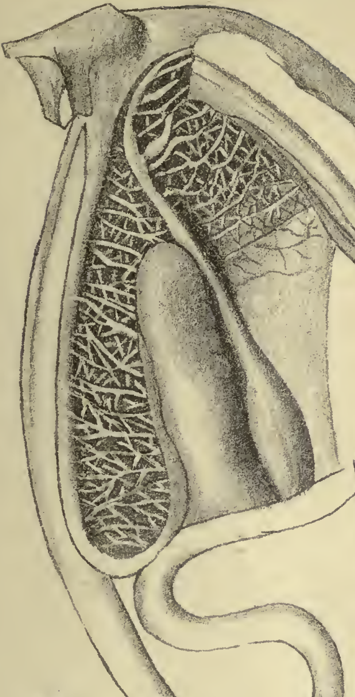

26


29

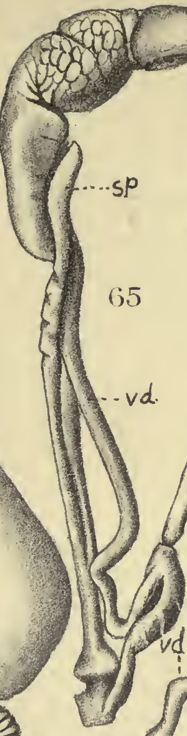

Mr
vd
p
p
vd
vg
a
30


31

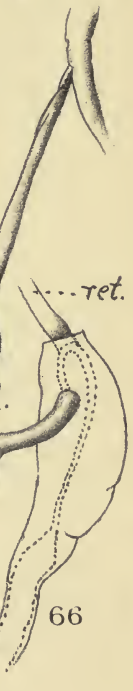

32



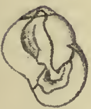
64



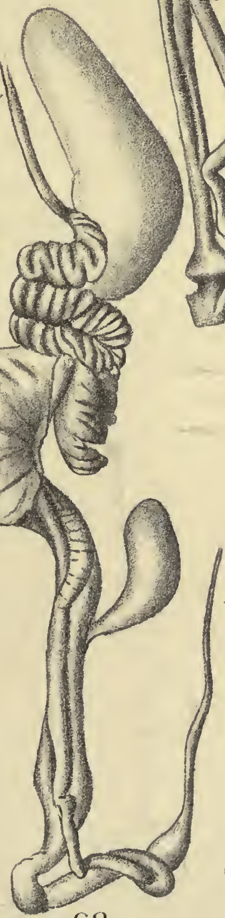
65



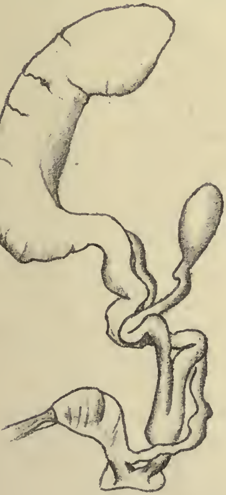
66



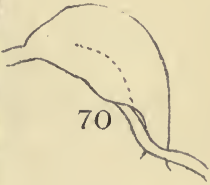
67



68

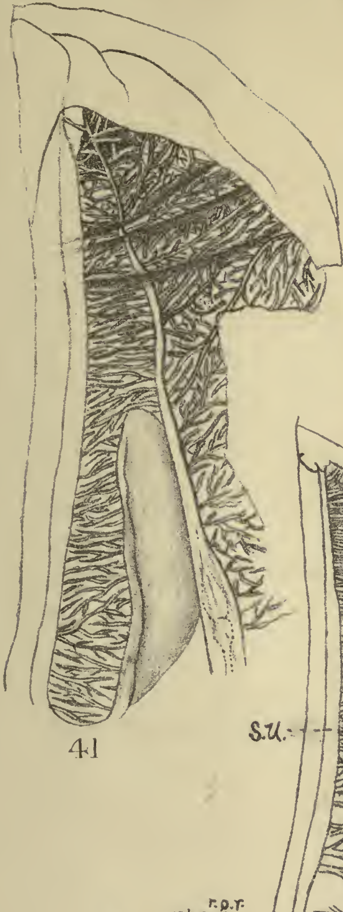


69

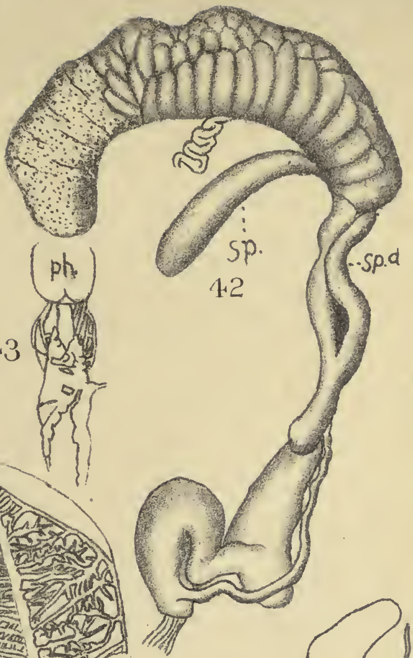


70

71

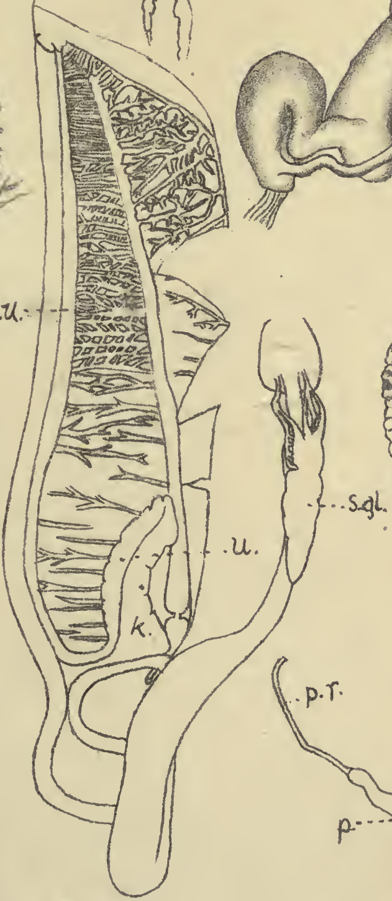


41

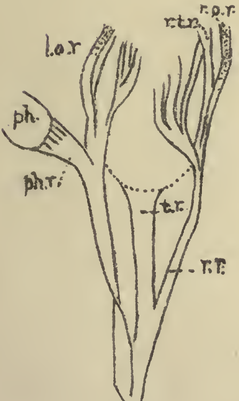


42

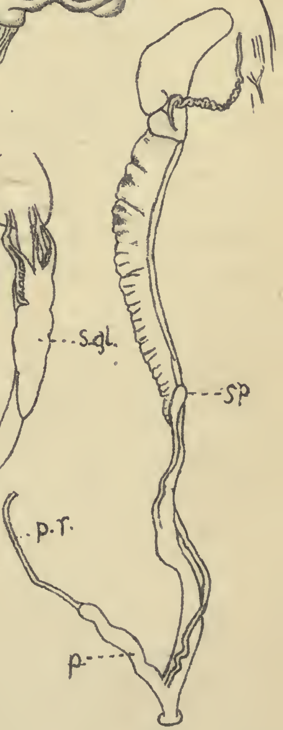
43



44


r.p.r.
r.t.n.
l.o.r
ph.
ph.r.
t.r.
r.r.

45



46

THIS BOOK IS DUE ON THE LAST DATE STAMPED BELOW

RENEWED BOOKS ARE SUBJECT TO IMMEDIATE RECALL

USDA DOC. DELIV. SYSTEM
INTERLIBRARY LOAN
DUE 14 DAYS AFTER RECEIPT
Returned
AUG 4 REC'D

LIBRARY, UNIVERSITY OF CALIF

Book Slip-25*m*-6,'66 (G38

Nº 551385

QL403
T76
ser.2
v.17

Tryon, G.W.
Manual of conchology.

LIBRARY
UNIVERSITY OF CALIFORNIA
DAVIS